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TRENDS

FALL 1989

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Problem Solving in Libraries

*A Festschrift in Honor of
Herbert Goldhor*

Ronald R. Powell
Issue Editor

University of Illinois
Graduate School of Library
and Information Science

LIBRARY TRENDS

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Library Trends, a quarterly thematic journal, focuses on current trends in all areas of library practice. Each issue addresses a single theme in-depth, exploring topics of interest primarily to practicing librarians and information scientists and secondarily to educators and students.

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The style and tone of the journal are formal rather than journalistic or popular. *Library Trends* reviews the literature, summarizes current practice and thinking, and evaluates new directions in library practice. Papers must represent original work. Extensive updates of previously published papers are acceptable, but revisions or adaptations of published work are not sought.

An issue editor proposes the theme and scope of a new issue, draws up a list of prospective authors and article topics, and provides short annotations of the article's scope, or else gives a statement of the philosophy guiding the issue's development. Please send your ideas or inquiries to F.W. Lancaster, Editor, Publications Office, 249 Armory Building, 505 E. Armory Street, Champaign, IL 61820-6291.

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Herbert Goldhor

Problem Solving in Libraries

CONTENTS

Introduction <i>Ronald R. Powell</i>	153
Information Clustering and Problem Solving <i>Alan R. Samuels</i>	157
Library Cost Analysis <i>Paul B. Kantor</i>	171
Managerial Accounting and Changing Models of Administrative Behavior: New Methods for New Models <i>G. Stevenson Smith</i>	189
Problem Solving through Experimental Research: The Need for Better Controls <i>Sharon L. Baker</i>	204
Questionnaire Ambiguity: A Rasch Scaling Model Analysis <i>A. Bookstein and A. Lindsay</i>	215
The Model of Science and Scientific Models in Librarianship <i>Terrence A. Brooks</i>	237
Evaluative Research in the Library and Information Field <i>Thomas Childers</i>	250
Output Measures in Libraries <i>Nancy A. Van House</i>	268

CONTENTS (*Cont.*)

Increasing the Usefulness of Research for Library Managers: Propositions, Issues, and Strategies <i>Charles R. McClure</i>	280
Herbert Goldhor—A Tribute and Bibliography <i>James Krikelas and Charles A. Bunge</i>	295
The Right Study of the Right Issues at the Right Time: Conducting In-House Studies in Public Libraries <i>Eleanor Jo Rodger</i>	313
About the Contributors	323

Introduction

RONALD R. POWELL

THIS ISSUE OF *Library Trends* has a twofold purpose. One, it has been designated as a Festschrift for Herbert Goldhor and as such marks his retirement from the University of Illinois Graduate School of Library and Information Science (though he continues to be active as a scholar) and serves as a tribute to his many contributions to the library profession. Two, as an issue of a scholarly journal, it is intended to make a significant contribution to the literature of library and information science. In developing the theme, care was taken to identify topics that reflect Herbert Goldhor's professional and research interests. On the other hand, it was deemed desirable to avoid excessive duplication of topics already adequately treated in professional journals and standard texts. Overlap with the 1964 *Library Trends* issue on research methods and the 1984 issue on research in librarianship was generally avoided as well.

It was concluded that an issue broadly devoted to applied and evaluative research methods as utilized for problem solving in libraries would appropriately reflect Goldhor's interests yet would not be too repetitious of earlier works. Perhaps Goldhor has been more closely identified with basic research than applied research, but one of his major objectives has always been to facilitate the administration of libraries. For example, he is noted for his experimental studies, but they have been generally designed as field studies with substantial attention given to their practical implications.

In developing ideas for specific articles in this issue, an attempt was made to identify research methods that represent relatively new and innovative approaches to solving problems in libraries. Important

related concerns such as administering in-house studies were pegged for attention as well. And it was realized that no *Festschrift* honoring Herbert Goldhor would be complete without an article on experimental research.

A *Festschrift* is, of course, a volume of learned essays written by colleagues and admirers, serving as a tribute to a scholar. The group of authors contributing to this work includes a number of individuals noted for their research expertise and their thoughtful, influential contributions to the literature. For this occasion they produced articles that identify and discuss some of the types, methods, and techniques of applied and evaluative research; consider some of the conceptual and practical issues associated with conducting and utilizing research for problem solving in libraries; and recognize the many professional contributions of the scholar being honored. The authors were encouraged to take fresh looks at their individual topics where possible.

Anyone familiar with Herbert Goldhor's research and writings would be aware that he has been a strong advocate of the scientific method of inquiry as a framework for research. Appropriately, this *Festschrift* opens with an article by Terrence Brooks in which he identifies the theoretical model as one element of the scientific method and considers its role in problem solving. His article, along with the one by Alan Samuels, is one of the more theoretical pieces in the issue.

In the second article, Thomas Childers takes on the difficult task of presenting an overview of evaluative research. He reviews the nature of evaluative research (its orientation, methods, etc.), takes a close look at one model of evaluative research and relates it to library and information science, and then ponders the current state of evaluative research in the field.

The next four authors deal with some approaches to evaluating libraries and gathering data to facilitate decision-making and problem solving. Nancy Van House defines performance and output measures, briefly reviews their history, and discusses their role in problem solving. She also considers some related issues such as the variability of performance measures across libraries, their sensitivity to change, and the interpretation of performance measures.

In a related area of inquiry, Paul Kantor takes up the matter of library cost analysis. Cost analysis for libraries, similar to performance measures, is a type of research method/management tool receiving increasing attention from librarians as they become more and more concerned about accountability. The techniques and principles of functional cost analysis are well established in service industries that generate a profit but less so in institutions such as libraries. Kantor addresses some of the details, principles, and problems of functional cost analysis as used with libraries.

Another technique seldom used by library administrators is managerial accounting. G. Stevenson Smith's paper introduces

managerial accounting as a means for solving library problems and then focuses on using it to evaluate the performance of administrators. He also provides links between the broader performance measures approach to problem solving and the use of accounting data. Stevenson's essay reflects a somewhat different, original, and not always optimistic perspective on solving problems in libraries.

In a more traditional vein, Sharon Baker examines the use of experimental research methods for problem solving. As was noted earlier, Goldhor has been known as a proponent of experimental research in librarianship and, as Baker indicates, experimental methods continue to hold real potential for improving the management of libraries. She considers the feasibility of doing experimental research in libraries and discusses the types of controls needed for successful experiments in libraries while providing relevant examples throughout the article.

Survey research methods are abundantly treated in the library and information science literature and so are not covered directly in this work. Abraham Bookstein and Ann Lindsay do discuss the questionnaire as a valid technique for gathering information needed to solve problems. They address some of the problems associated with questionnaires such as question ambiguity, report on a study of question ambiguity, and apply the Rasch Model (a type of scale) to the results of the study.

Alan Samuels takes what he calls a speculative look at a nontraditional use of information to solve problems in libraries. He argues that information can be organized into "clusters" that represent the type of information communicated to problem solvers as well as the format in which the information is conveyed. Samuels closes with a discussion of the utility of a theory such as information clustering.

Charles McClure and Eleanor Jo Rodger focus on some of the more pragmatic issues related to using applied and evaluative research methods in libraries. McClure discusses the role of research in assisting library managers in operating libraries more effectively, offers some propositions and strategies for increasing the impact of library research, and looks at some related issues such as the adequacy of data and rewards for researchers. He concludes with an appeal for a closer relationship between library managers and researchers. Rodger points out the value of measurement and evaluation studies as tools for describing, understanding, and improving library services and gives advice on deciding what to study, on conducting an in-house study, and on reporting and using the findings of a study.

James Krikelas and Charles Bunge, who are, along with Baker and the issue editor, Goldhor's former doctoral students, prepared the final article. They present a biographical sketch of and tribute to Herbert Goldhor and take a closer look at his contributions to public library service and administration and to research in librarianship. Their article concludes with a comprehensive bibliography (about 178 titles) of Goldhor's publications.

In closing, I would like to take this opportunity to add a couple of personal comments. First, it was a pleasure to edit papers contributed by a group of such veteran and accomplished authors. Their efforts are greatly appreciated. Second, it was gratifying to be given the opportunity to edit a Festschrift for Herbert Goldhor. His insistence on research that is conceptually based and rigorously conducted and his encouragement to make research a regular, ongoing activity has in no small way influenced my research and no doubt that of many others.

Information Clustering and Problem Solving

ALAN R. SAMUELS

ABSTRACT

PEOPLE ABSORB INFORMATION holistically rather than separately from different levels ranging from the smallest to the highly visible, from the subconscious mind to the written record. A major problem in the transfer of information lies in recognizing that matching information dissemination techniques at all organizational levels to the characteristic ways people absorb information is critical in ensuring the success of providing the right information at the right time.

INTRODUCTION

This article looks at some perceptions of information that are not yet part of the mainstream of information management but may have substantial impact in the future. The purpose of this discussion is to suggest that problem solving in library administration requires alternatives to traditional uses of information not only in solving but also in understanding problems. Such a reorientation involves an interdisciplinary approach to the nature of information. In this process it becomes apparent that various levels or "clusters" of information sources exist. A similar view was suggested by Taylor (1986), who identified information "chunks" as representing "in cognitive psychology...a means for talking about a mental grouping of data in which complexity, recall, understanding, and familiarity are significant factors" (p. 8). Library management involves information transfer using a variety of media. Understanding how different staff both individually and in groups receive and use information and the medium by which it is transferred for problem solving is essential to ensure efficient library service.

LACK OF ADEQUATE DEFINITION

Instead of decreasing, the confusion over the nature of "information" has increased. This has caused a major problem in many areas of library management such as job descriptions that not only do not adequately convey exact responsibilities to employees but, more importantly, confuse those writing these descriptions. In normal use the term is viewed as a noun, verb, adjective, or synonym for something else (e.g., data). Conceptually *information* has been described as a process, a record, an abstract relational term such as *meaning* or a surrogate for something as yet undefinable. Catalogs are "information banks" while librarians are "information specialists." We communicate information, store information, access information, transfer information, describe "information rich" environments, prepare "chief information officers," develop "management information systems," and discuss "value-added information." However, as Maricic (1987) and others have pointed out, "no consensus as to the scope of the [information] concept, let alone its definition, has been reached" (p. 34). In some cases we avoid defining the term and emphasize process. For example, Taylor's (1986) work on "value added information" is process oriented and hence ignores the problem completely by referring to information as a "port-manteau word to cover data, information, and knowledge" (p. 9).

Nor have information retrieval systems been exempt from this confusion. In library management, information retrieval systems have been variously defined as "management information systems," or "decision support systems" directed by a "chief information officer." This situation is at least partially caused by the lack of any clear distinction between the commodities with which information retrieval systems deal, resulting in what Teskey (1989) calls "no clear distinction between data, information, and knowledge" (p. 8). In short, we do everything to information but define it. Thus we may be unable to focus on what it is that libraries actually do.

Some propositions can be made. Information is discipline and activity dependent, contingent upon an arbitrary use of the term according to ordinary practice within each field of study or locus of activity (Fox, 1983, pp. 4-5). In an attempt to bring some order into this discordant situation, Debons, Horne, and Cronenworth (1988) have described information as defined by the way it is used (pp. 2-3). They characterize information as a "commodity, energy, communication, fact, data," and "knowledge." Although this does not particularly contribute to understanding of the term, Debons, et al. represent the information concept as a type of "knowledge spectrum," one that encompasses a variety of different levels ranging from the cognitive to the external record. The authors consider that events lead to symbols representative of such events. These symbols are arranged according to a set of rules in order to establish a context. In management terms, a context represents a department or service. When a context is established, awareness follows.

Templates or models are constructed within which "chunks" of information can be combined (Teskey, 1989). With awareness comes a broad clustering of information to which meaning in context is ascribed. Information is formalized, perhaps in policy statements, goals, objectives and the like; is given an intellectual value; and becomes part of the "body of knowledge" or procedure manual that guides the way a library is governed (Debons et al., 1988, fig. 1.1, p. 5).

The importance of Debons's spectrum of knowledge lies in its implicit recognition of information as a continuum, not harmonious with any single definition but rather dependent upon the cognitive level at which it originates. If one recognizes the cognitive nature of information, it becomes necessary to look at information in a cross-disciplinary way. One such attempt was made by Machlup and Mansfield (1983) who brought together specialists in both the hard and soft disciplines and asked them to define "information." The chaotic results forcefully confirmed the contingency character of information. There is no adequate and universal definition of information. What does emerge is a variable dependent upon the context in which it is used. Since information means different things to different people, understanding how people view information within the contexts of their own lives can contribute markedly to the development of information delivery systems by library management.

Others have equated "information" with "knowledge"—an equation considerably distant from Shannon and Weaver's (1949) mathematical formulation of information transfer as the communication of messages regardless of their semantic content or perceptual reception. According to some commentators, information should not be separated from knowledge. For example, Kemp (1976, p. 12) has argued that "information" and "knowledge" are interchangeable terms, metaphorically similar to Taylor's "portmanteau." He suggests that the distinction between "sources of information" and "sources of knowledge" is a tautology that merely confuses rather than clarifies the role libraries play in society and, on a more micro level, the responsibilities of library staff.

However, the expansion of information to include the process of informing or transfer as well as that which is transferred, represents a view that, though problematical, appears to have many adherents resulting in the now respectable phrase "information transfer." Finally, William Paisley (1968) summarizes the current view of process and product by noting that "communication is a process of social exchange...while information is the object of the exchange" (p. 124).

In brief, there is consistent agreement that whatever information is, it is a multifaceted entity that has the dynamics of transfer and the substance of a commodity. The reductionist view of information as solely the document itself (a memorandum, letter, or other written item) has gone out of favor. The current view seems best expressed by Shera

(1972) who long ago commented that "in the generic sense, [information] is that which is transmitted by the act or process of communication, it may be a message, a signal, a stimulus. It assumes a response in the receiving organism and, therefore, possesses response-potential" (p. 164). In an organization, directives to employees are communicated in many ways without necessarily receiving a predictable response.

Buckland (1983) gives a stricter definition of information as a *process* and provides a map of how informing works. This process expands upon Shera's formulation by placing considerable emphasis on such variables as personal knowledge, personal values, cognitive skills, perceptual skills, and "distressing ignorance" (p. 96). Culnan (1985) provides an added dimension to the information concept by noting how perceived accessibility is an important component in the conceptualization process. Citing Mooers, who said that, "an information source or system will tend not to be used whenever it is more painful and troublesome for the customer to have the information than it is not to have it" (p. 302). Culnan stresses that information accessibility, like information itself, is a multidimensional concept consisting of at least three elements:

1. Physical access—the actual mechanism by which access is achieved.
2. Interfacial access—the way in which the access mechanism is made usable by the accessor.
3. Informational access—the "aggravation quotient," the physical effort to obtain information compared to its value in the accessor's context.

Culnan concludes by suggesting that *perception* of information access mechanisms by the accessor is the major factor determining its use. Thus it is perceptual barriers that must be examined at least as much as the information itself.

Others have related the administration-staff information and acquisition process to a series of psychological variables that, while apparently not of much interest to library managers, are basic to industrial psychology. In a series of articles, Samuels and McClure investigated the role that organizational climate plays in the acquisition and dissemination of information. They discovered that the use of specific sources of information is related to the perceived organizational climate of the library. In libraries where there are mutually supporting relationships among staff and administration, information flow is expedited and used to solve problems in a much more expedient way than in highly bureaucratic and rigidly structured organizations (McClure & Samuels, 1985, pp. 483-98; Samuels, 1979, pp. 237-54; Samuels & McClure, 1983, pp. 1-20).

In organizations not specifically concerned with information transfer, the term *information* is used in a wider sense. For example, the business sector has been particularly involved in describing the components of information without worrying about its definition. Marchand

and Horton (1986) represent this utilitarian view of information by distinguishing between "information resources" and "information assets." According to them, information resources are:

1. individuals having information-related skills;
2. information technology hardware and software;
3. information facilities such as libraries, computer centers, communication and information centers; and
4. information handling and processing suppliers.

While information assets include:

1. the formal data, document, and literature holdings of the company;
2. the know how it possesses both in the form of intellectual properties like patents and copyrights, and in the form of individual expertise; and
3. the business intelligence and information it possesses about its competitors, its business environment, and its political, economic, and social environment (p. 71).

This categorization of information resources and assets serves to delineate the components of information. Because easily understandable terms are used, the value of information to employees increases substantially and, by extension, to the organization as a whole.

Lacking a utilitarian description of information may invalidate many performance measures developed by managers to measure library effectiveness by not clearly specifying what library service or activity the information is supposed to measure. Smith (1980) has pointed out that measuring information is really measuring only coded signs without regard to their meaning (p. 22). It is only in the daily work life of members of an organization that information assumes meaning and utility. From the systems point of view, members of an organization must compare their perceptions of similar information with each other. In other words, what means something to one recipient may have an entirely different meaning to another.

There are many examples of ambiguity of meaning with which library managers have to deal: what is meaningful to a public service librarian may not be so to one in technical services. For example, although considered a "written record," the catalog card is a part of information transfer as well. The components of a catalog card, ranging from classification number to subject tracings, are the data that are transferred into meaning by the value added processes of cataloging and classification. The end product is then used by others to determine whether or not a particular item in the library is relevant to their specific information needs. The systemic nature of information represented by the written record (the catalog card) depends on whether or not the producer of the card is able to understand the context within which the user will view it, a user whose frame of reference may be entirely different from that of the producer.

Even automation may not alleviate the problem. A MARC record, for example, consists of a series of data elements preceded by identifiers in a sequential order. In other words, there is a clear syntax to the record similar to that of a verbal or written sentence in which different data are linked together by tags, terminators, and other syndetic mechanisms placed at fixed points in the record. For exchange purposes, an unlinked MARC record serves as text. For interpretation, however, the linkages must be reestablished, or placed in context, to be of any use (Gerrie, 1986, p. 5; Crawford, 1986). Eventually the collection of data, links, tags, and text make the bibliographic record.

However, every record must be translated into terms which the recipient can understand. A raw MARC record does little to help a librarian understand how best to serve patrons, nor does a poorly written memorandum aid in the problem solving process. Managers who ignore potential ambiguities in what they convey to their employees risk misunderstanding or, even worse, incomprehension by employees which results in total inactivity—i.e., the job never gets done. Librarians who develop mission statements, goals, objectives, and performance measures, neglecting linkage and communication with those outside of the library, risk disillusionment and funding cuts. In summary, everything that is communicated has an information component and a purpose. That component and purpose must not only be understandable to the sender but also to the receiver, and it should be delivered at a level understandable to the user. Just as advertisers of commercial products carefully choose the media and programs to convey their messages, so also must libraries develop the marketing acumen to match transfer medium, construction of information statements, and psychological life-style of the recipient (Devore-Chew et al., 1988).

TOWARD A TAXONOMY OF INFORMATION CLUSTERS

If it is reasonable to suppose that information is as multidimensional and interdisciplinary as claimed, we are required to seek its components outside traditional library and information science areas. In doing so, categorizing information clusters might be considered as one way of mapping this multidisciplinary approach. The map serves to convey the type of information that needs to be communicated to problem solvers as well as the format in which the information is transmitted.

The taxonomy consists of thirteen groupings of data elements that coalesce to form what might be called an information template. Specifically, these information clusters are: information paradigms, conventional wisdom, written records, semantic intersubjectivity, language and syntax, syndetic structures, context, symbolic representations, linguistic utterances and speech acts, data bonding, data reduction, data assimilation, and template formulation.

Less understood, less measurable, and virtually ignored by infor-

mation studies are those information clusters that are below the level of consciousness. In the list given earlier, these would be data bonding, data reduction, data assimilation, and template formulation. It is these clusters that make conscious activities possible. The subconscious coalescence of information clusters forms a "latent understanding" just below the level of verbal expression which impels the individual to seek satisfaction for that need. It is the manager's responsibility to provide guidelines for the employee's understanding for job clarification and its consequent need gratification. Workers do far better jobs when they know why and how their efforts contribute to the well being of the company.

A good discussion of this level of information clustering is given by Emanuel Peterfreund. In stressing a psychoanalytic and biological approach to information clustering, Peterfreund (1971) notes that, "in general, the biological organism possesses information from (a) phylogenetic sources—transmitted by the genetic code; (b)—ontogenic sources—memory or residues of irreversible experience; (c) current, ever-present stimuli of various kinds, from inner or outer sources; and (d) feedback from the organism's monitoring of its own operation (p. 119).

What seems to separate subconscious and latent information clusters and conscious clusters is language. When internal symbols become visible signs, information becomes transferable. When information becomes transferable, intersubjective understanding can be reached. In other words, organizational coordination of tasks is accomplished only when understanding (though not necessarily agreement) on the meaning of what needs to be done is achieved by organizational members: workers might not agree that a particular service is necessary but at least understand what is being done. Data are also converted into transferable information by the computer programmer. For example, Lachman et al. point out that computer manipulation of data is, in essence, the placement of data in a context that makes it both accessible and understandable to the user. "Computers take symbolic input, recode it, decide about needed input, make new expressions from it, store some or all of the input, and give back symbolic output. By analogy that is most of what cognitive psychology is all about (Lachman et al., 1979, p. 99).

It is through cognitive psychology that the clustering of information can best be understood. The recent emphasis on the study of linguistic behavior by cognitive psychologists (psycholinguistics) has recognized that gradual clustering and codification of information takes place prior to its use in problem solving (Gardner, 1987, pp. 214-15). This clustering rejects the lawlike explanation of information processing in favor of a more environmental set of linkages arrived at through what Lachman et al. call an "information processing paradigm." The paradigm consists of a number of cognitive processes that are performed on data in order to convert it into conscious information.

Among these are symbol manipulation, symbol representation, and analogous thinking (Lachman et al., 1979, p. 90).

Another strategy for clustering information has been proposed by Johnson (1984) who suggests that the isolation of data is reduced by a process of "dialectical synthesis" (p. 205). Johnson proposes that the common underlying structure of information (the context) is established through a reductionist interaction among different data elements. This interaction serves to: (1) reduce redundancy by forcing a selection of admissible versus inadmissible data, (2) combine like data elements to form clusters, and (3) gather each cluster of data elements into a unified system or totality. After this process occurs at the preconscious level, the information thus acquired is subjected to interrogation at the conscious level by the individual. Interrogation allows the individual to compare newly emerged information needs with prior experiences and existing programmed knowledge, separate the heuristic from the already known, and reformulate the residual into a message that is, in itself, subject to translation by others into the language of an information system. Put in library terms, an analogy may be drawn by examination of the managerial decision-making process. An individual "feels" a need for information that can resolve a problem created by either external or internal stimuli. That individual engages in a search process beginning with the most familiar and expanding outward until a possible source for obtaining the information is arrived at. If the needed source happens to be a librarian, the individual contacts a librarian who in turn translates the information need voiced by the individual into the language of existing information sources either inside or outside of the library. An acceptable response will then be given to the decision-maker and incorporated into that seeker's long or short term memory bank where it forms another part of that decision-maker's knowledge. Thus the process continues in a constantly changing hermeneutical circle. Decisions are resolved by information which in turn is programmed into policies. Information gathered through performance measures is analyzed and used to develop services.

The transference of latent to manifest occurs through many processes that can be subsumed under the term *hermeneutic*. There is already a vast literature on hermeneutics (Belicher, 1982; Howard, 1982; Bernstein, 1983; Rosen, 1987). Here a brief review of the concept is given in order to place it in the context of this article.

"Hermeneutics" is basically the study of meaning arrived at through experience. That is, a person understands a phenomenon by participating in it. Thus, in dialogue, people understand the phenomenon of speech by the act of speaking. Derived primarily from literary criticism, hermeneutics has intruded into many different disciplines ranging from sociology to education. It has even touched librarianship through the works of Michael Harris (1986) and H. Curtis Wright (1986). The classic interpretation of hermeneutics describes it as a means

by which we continually refine a phenomenon until it becomes clearer and clearer (Gadamer, 1988). As we repeatedly reflect on a phenomenon, that phenomenon assumes a recognizable shape. In management terms, the more a problem is studied, the more it becomes familiar and the more we begin to understand its particular nuances. Another analogy is online searching. One becomes a good online searcher by constant and ever changing repetition and not by classwork.

Perhaps the best description of "the hermeneutical circle" has been given by Palmer (1969) who writes that:

Understanding is a basically referential operation; we understand something by comparing it to something we already know. What we understand forms itself into systematic unities, or circles made up of parts. The circle as a whole defines the individual part, and the parts together form the circle. A whole sentence, for instance, is a unity. We understand the meaning of an individual word by seeing it in reference to the whole of the sentence; and reciprocally, the sentence's meaning as a whole is dependent on the meaning of individual words. By extension, an individual concept derives its meaning from a context or horizon within which it stands; yet the horizon is made up of the very elements to which it gives meaning. By dialectical interaction between the whole and the part, each gives the other meaning; understanding is circular, then. Because within this "circle" the meaning comes to stand, we call this the "hermeneutical circle." (p. 87)

INFORMATION FOR PROBLEM SOLVING

According to Robertshaw, Mecca, and Rerick (1978), problems "are characterized by three factors: a multiplicity of interactions (the problem is 'complicated'); a necessity to identify what is good and what is bad; and gaps in our knowledge of the situation" (p. 3). The authors continue by describing four processes by which problems are solved: the problem is defined; alternative solutions are generated; the solutions are evaluated; and an iterative procedure is followed. These processes do not exist in isolation but rather form a system in which solutions are arrived at through reconsideration of variables (or "information") that emerge through each phase of the problem solving process.

Problem definition is the most crucial step in the entire process and can only come with recognition that problems, like information, exist at many levels. Although the problem solving process can begin with recognition of immediate decisions to be made, as each decision is made and programmed it is likely that other problems will emerge, many of which have been unrecognized or are new. As dialogue between supervisor and supervised occurs, new understandings are reached about what is required to get the job done.

According to current linguistic thinking, "understanding" is a matter of translation. In Debons's scheme cited earlier, the translation process consists of formulating rules which can organize the symbolic representation of events in the information seeker's mind. These rules are not necessarily the property of any one participant in the problem solving process but rather are arrived at by mutual agreement as to the contextual meaning of the visible symbol. For example, if a supervisor

writes down his/her understanding of the objective of an employee in the management by objectives (MBO) process and then shows it to that employee, that supervisor has no way of knowing beforehand whether or not the employee will understand what is written. However, if the supervisor has taken the time to evaluate the environment within which the employee normally works, the supervisor's ability to translate accurately his/her understanding of the employee's objective is strengthened.

Problem solving is basically a cognitive activity. Data gathered through community surveys, needs assessments, information audits in organizations, and similar techniques may be objectively summarized but must be subjectively interpreted. The Public Library Association's role setting manual clearly recognizes the importance of cognitive interpretation through its urging that those who would plan services that are of use to their communities take whatever time necessary to "look around," to gain a subjective impression of the context in which services must be provided. Impressions are obtained through a combination of cognitive processes, among which are archetypical representation, data assimilation, data reduction, and data bonding.

Archetypical Representation

At the most basic level of the human mind lies the archetype. In psychoanalytic terms, the archetype cannot be exactly defined. It is a pattern that can only be recognized by the effect it produces (Jacobi, 1959, p. 31). An archetype is a mode of apprehension, a prototype of perception, that establishes a psychic context for data assimilation and template formulation. Although the existence of the archetype can never fully be verified, adequate empirical support for its existence has been suggested (Mattoon, 1981).

The function of the archetype is to utilize whatever innate characteristics the individual has to begin the process of ordering the thought process through the creation of templates within which data can be placed. Precisely how this mechanism works is unknown, but we can gain a dim glimpse of the process whenever an idea arises in our minds from no discernible source. When the template is formed, data assimilation begins.

Data Assimilation

The senses continually absorb stimuli to an overwhelming degree. Most data are not recognized as such since they are assimilated at the subconscious level. In many ways this is similar to Abraham Maslow's (1970) basic "instinctoid" needs—needs which are "vague, unquantifiable, and hardly scientific" (p. 96). It is also what distinguishes the elusive "managerial style" from the more concrete "management science." As more and more data are assimilated, it becomes necessary to reject as well as to gather data to avoid an overloaded state produced by

excessive redundancy. When a balance is reached between a person's ability to combine data into recognizable information, data assimilation is stopped. When achieving such a balance is ignored, the result is information overload and indecision.

Data Reduction

Data reduction is the process of eliminating redundancy. Like data elements are combined or clustered. These clusters are the origins of preconscious needs whenever there is a part of the cluster that is missing. An analogy is a puzzle in which all but one piece is present. It is the search for that piece that bonds different data clusters together.

Data Bonding

As a decision-maker approaches a problem, he/she may have some idea of what information is needed to solve it. This may be quite conscious or still little understood. This phenomenon is often seen occurring in libraries. "Browsing" is one example of information-seeking without necessarily having a conscious purpose, and "searching the card catalog" is another. Most cataloging systems are predicated on the presumption that people are familiar with the area of information they are seeking. However, it is common enough to observe people exercising a random search pattern for "something interesting"—what might be called the serendipity factor.

Data bonding creates information clusters that act as stimuli to conscious, rather than latent, acts. The speech act itself is a verbal representation of internal need even though it may not be understood by others. However, it is through the process of socialization and interaction that mutual understanding is achieved by the establishment of contexts in which speech becomes meaningful—i.e., for informative.

THE PASSAGE FROM INFORMATION TO THE WRITTEN RECORD

At the conscious level, environmental and contextual factors take hold of those formerly internalized information clusters and continue to transform them. Speech acts are combined in a "semantics of interaction" and become symbolic representations of visual phenomena (Rasmussen, 1985, p. 57). Syndetic structures are identified and created in order to facilitate the retrieval of these symbolic representations. "Languages" of varying kinds are produced through the combination of symbols and syndetic structures. These languages have both semantic and semiotic aspects. A programming language, for example, may be entirely incomprehensible to the nonprogrammer but still has the same structure as normal discourse. All written records have languages of their own. Without observing a strict sequence of placement of data elements, neither a MARC record nor a printed catalog card would have meaning. Without understanding the overall mission of an organization, a manager would find it very difficult to develop goals and objectives.

Information clusters are continually refined through the addition of values, environments, connectives, and mutual agreement about interpretation. Eventually they become "programmed"—i.e., become part of that conventional wisdom or body of knowledge that managers use to guide their selection of techniques and styles. Selection of the management mix of techniques and styles is the major problem with which managers must contend.

Problem solving requires presentation of information that is comprehensible and transferable. It does little good to present a written document to others as "information for problem solving" unless the recipients are aware of the context within which to view that information. Each individual or group has preconceived perspectives about a problem developed through a combination of preconscious information clustering and external experiences. It becomes essential for the information communicator to understand and not necessarily agree with these preconceived perspectives. Understanding what these perspectives are can lead to training programs which enable individuals to translate their own perspectives into the language of the environment in which the problem must be solved—a method well known to educators who, in dealing with multicultural environments, describe the process as linking understanding of the world with the word. "From the beginning, in critical and democratic practice, the reading of the world and the word are dynamically linked. The command of reading and writing is achieved beginning with words and themes meaningful to the common experience of those becoming literate, and not with words and themes linked only to the experience of the educator" (Freire & Macedo, 1987, p. 42). When the written record becomes recognizable to the user in his/her own terms, it is suitable for problem solving.

UTILITY

The value of any theory lies in its utility. *Utility* itself is a charged word and requires the addition of purpose: "utility for what?" There is considerable reason to believe that an understanding of the psychology of information clustering has significant utility in promoting library service. Herbert Goldhor's own extensive work in studying the best way to display library materials (prime display areas) is a very practical example of translating the theoretical to everyday use. It also recognizes the tendency of people to seek that which appears to be intersubjectively recognized as "good." Library users may not like a best-selling book but sometimes read it because everyone else supposedly does. Labeling is yet another mechanism that facilitates the search process by describing the content of many different items through one or two symbols.

From the overall perspective of what a library is supposed to accomplish, perhaps the most important use of the process of information clustering is in directing the library patron. It is now part of the "conventional wisdom" of library practice that patrons use libraries for

many reasons other than reading. Libraries accommodate both readers and nonreaders. With this recognition comes the need to communicate in ways that deal with all classes of library users ranging from the illiterate to the scholar. A good example of recognizing the visible communication of symbols occurs every time someone takes a vision test for a driver's license: he/she is asked to interpret wordless symbols rather than labels, interpretations that come about through experience and common agreement about their meaning. The implications of this for developing unified information transfer systems such as signs or online public access catalogs in libraries and other information agencies are substantial, especially in the multicultural environments within which libraries exist. Can we communicate the possible uses of the library without words or other limited mechanisms? It is the library manager's responsibility to use every means possible to match the needs of employees with those of the organization. Promoting unity of action and mutual understanding by library employees at all levels through careful use of information transfer devices, recognizing which such devices match the capacities of the receiver, and sensitivity to the many different points of view held by organizational members will contribute to providing good library service.

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Library Cost Analysis

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ABSTRACT

A PROCEDURE FOR FUNCTIONAL COST analysis is presented. All costs of materials and services are allocated to a set of library functions representing direct services to users or patrons. The functional or unit costs thus calculated may be reconciled to account for the entire library budget. Functional cost analysis is useful for planning, management, and budget justification.

INTRODUCTION

The purpose of cost analysis is to attach costs to the products or services created or rendered by an organization. In the case of a library, there are no tangible products (except for photocopies) and the primary "product" is a range of services. The first problem in studying library costs is to identify these services in an organized way, and to decide what characteristics of these services drive the cost picture. It is customary and quite sensible to divide the services the library provides into technical services and public services. Public services, now more properly described as access services, help to bring patrons into contact with information-bearing materials (Hayes, 1979). Technical services help to acquire and organize those information-bearing materials so that access may be facilitated. At present, acquisition forms the major part of the technical services side of the ledger. There is a large budget for the purchase of books and materials. There is a further budget for the management of periodicals as they come in and for the cataloging of other serials and monographic materials. Although the cataloging activity has been, and continues to be, radically transformed by the

existence of national utilities such as OCLC and RLIN, it remains a substantial cost of technical services. A rapidly growing cost component, but still not yet large in absolute terms, is the development and maintenance of computer systems and services typified by the online public access catalog.

These new computerized services have the goal of making available to the library patron (in this context frequently called the end user) the same technology used in technical services for more than a decade. Developing these systems and ensuring their usability, reliability, and upward compatibility in a rapidly changing scene, requires a new level of technical skill and professionalism which has not yet been fully recognized in the library profession.

Public services are the familiar activities by which the patrons or end users interact with information-bearing materials. Broadly speaking, these include two types of unassisted access: use of materials in the library and circulation or borrowing of materials, and a very important category of assisted use called reference services.

Peculiarly enough, from the point of view of those who support the library, this relatively small group of public services (relatively small when viewed from a budget perspective) represents the entire library. In other words, the tip of the iceberg, perceived by the users, must carry the entire burden of justifying the library's existence, function, and costs.

Thus, as a first step in functional cost analysis of a library, these services must be quantified. This is a fairly difficult problem which falls into the general area of library performance measurement. Before this is discussed, it is essential to have an agreement on a definition of terms. Measures will have to be defined for the amount of in-house use of materials, circulation of materials and, perhaps most difficult of all, for reference service or support.

However, the *quantity* of service rendered, that tip of the iceberg, by no means tells the whole story. The services are rendered with one or another level of quality under several different definitions of what is meant by quality. The color or brightness of the tip of the iceberg might be thought of as a qualitative phenomenon, but one subject to some degree of quantitation.

In developing measures of the quality of a library's service, scales of measurement must be created. For an analogy, consider gemology in which qualities such as clarity, brightness, or hardness must be defined. Hardness, for example, is defined in terms of a series of materials each of which scratches the one softer than it and is scratched by the ones harder than it. This is hardly an ideal quantitative measure but at least it puts things into some kind of order. The numbers on this scale do not define the value of the gemstone, nor are they easily related to underlying physical properties such as intermolecular forces which might be responsible for the hardness of the material. Similar problems exist in the definition of such properties as the brightness of color and the loudness of sound.

Defining the qualities of library service is further complicated by the fact that one can distinguish between the physical processes of library service and the intellectual product of library service. In distinguishing between the quality of process and quality of product, the focus is separately on the easily measurable parts of library service and, with much less certainty, on the intellectual parts. Typical characteristics of a library process are the availability of a particular service, the effort (on the part of the user) associated with that service, and the delays involved. Availability is usually measured as chance of success, such as 50, 60, or 80 percent. Accessibility, thought of in terms of patron effort, may be measured in costs incurred by the user, energy expended, or time spent. Delays are measured in hours, days, or weeks that elapse between the expenditure of the user's effort and his actual receipt of the information-bearing materials. These delays originate in the policies, procedures, and practices followed by the library and in external events. These physical characteristics of the library service process are amenable to measurement and have been discussed at some length elsewhere (Kantor, 1984).

Measuring the quality of the product brings this discussion into the gray area where librarianship overlaps with information science. We would like to reach into the mind of the end user to see whether the information delivered actually meets his need. But there is no guarantee that even the end user really knows whether the need was met. For example, he may receive information which claims to be the answer to his problem when this is not true. Or he may receive a partial answer when there is a much better answer to be found in the same collection of literature. In information science, the two concepts of precision and recall (or their various transforms) are introduced in an effort to measure the quality of the product.

The "precision" of a response refers to the ease with which the end user can get the information he really needs from the materials that have been provided. For example, if he gets seven books and the answer is contained in one paragraph on one page of one of those books, then precision is very low. There is a great deal of other material he may have to sort through before settling on the correct answer. On the other hand, "recall" refers to the more difficult notion of "how much of the world's relevant information" has been provided to him. Estimating this is harder than knowing whether the user's need has been satisfied. It would be necessary to know, for the entire world literature, how many items are relevant. So, information science, although it has much to say about librarianship, does not provide foolproof methods for quantifying that qualitative aspect called "the quality of product."

We will not completely close the relationship between the quality of library services and the cost of providing them. Even though this issue will not be resolved here, it is important to note that the frequently made arguments that libraries with higher cost for their services are *ipso facto*

providing a better quality of service, are usually unjustified and often groundless. That they are unjustified is obvious since the measures of quality do not exist. That they are groundless is evidenced by the fact that variations in operating procedures can double or triple the cost of library operations.

AN EXAMPLE IN TECHNICAL SERVICES

Although public services have been called the tip of an iceberg, it is suggestive to represent the structure of library costs as an inverted pyramid balanced on a relatively small tip called public services. This representation of the problem makes it easy to think of costs as flowing down from the various operating activities and expense budgets to public services. The costs must be distributed onto the public services activities in order to make a clear link with the function of the library as it is perceived by those who support it and those who use it. To illustrate the problems that arise in cost analysis, this discussion will begin with technical services. In technical services the troublesome problem of what the user needs or gets does not arise. In technical services, the only concern is with the materials that are brought into the library and with their processing.

A typical breakdown of a technical services budget might look something like Table 1. Most of the budget is in salaries, with some additional space cost and other direct cost and an administrative overhead. Overhead is this activity's share of the central administrative cost of the library, the corporation, or the university. The operation acquires materials, so the costs that enter the picture are cost of materials acquired and the cost of the work performed on them.

How are we to think of this? One point of view is that the technical services operation buys a certain number of dollars worth of "library stuff." The entire cost of the technical services division could be treated as an overhead on the materials that are brought in. This is an impressive 115 percent ($= \$69,000/60,000$). In the language of cost accounting, all costs of the materials acquired have been "pooled" into one number which is called the base and the technical services division costs are "pooled" into another number which is called "the overhead."

It may seem strange to put labor costs as an overhead on other cost figures. It is much more common to distribute overhead on the basis of labor. However, in this regard libraries need a point of view which is becoming prevalent in industry. When labor costs are substantially changed through the introduction of automation, it eventually makes sense to treat labor as an overhead. It should be noted that, in the industrial situation, labor costs often fall to as little as 10 or 15 percent of total manufacturing costs with the heavy use of automation. In the library case, as in most service industries, labor costs are, at the moment, quite high. Baumol & Blackman (1983) has argued that this will remain true for all time, but the argument is not completely convincing.

TABLE 1
BASIC BUDGETARY INFORMATION

<i>Technical Services Budget</i>	<i>Basic Budget Elements</i>	<i>Budget Elements Allocated to Materials Handling</i>		
		<i>Peri- odicals</i>	<i>Serials</i>	<i>Mono- graphs</i>
Salaries	\$50,000	\$2,536	\$7,609	\$39,855
Space costs	\$4,000	\$500	\$1,500	\$2,000
Other direct	\$7,000	\$500	\$1,500	\$5,000
Overhead	\$8,000	\$464	\$1,391	\$6,145
Total	\$69,000	\$4,000	\$12,000	\$53,000

<i>Cost of Materials</i>	
Periodicals	\$30,000
Other serials	\$10,000
Monographs	\$20,000
Total	\$60,000

One might object to pooling as some materials are much more difficult to handle than others and are "handled in different departments." The fact that they are handled in different departments should be of no concern. If things can logically be pulled together, one should not be deterred by administrative history. On the other hand, if they require substantially different amounts of labor and if one is planning to do anything about it, it may be important to make a distinction.

An example of this kind of argument is shown in Table 1. The total \$69,000 of technical services costs is broken down into portions attributable to monographs, to periodicals, and to other books in series. A similar breakdown is also made of the costs of materials. As a result, three different overhead figures can be calculated, ranging from 13 to 265 percent (see Table 2).

This "simple example" of technical services costs has become somewhat complicated. There are two more important complications to consider. The first is choice of the base, and the second is inclusion of quality in the analysis. "Dollars expended" is an appropriate base if the library is thought of as no more than a purchasing agent for its institution. If the "function" is to "spend the money" on information materials, then efficiency is fairly measured by how much it costs to spend that money.

Choice of Base

But, even without regard to the end use of these materials, anyone familiar with library processes will realize that the dollar is not a particularly logical unit. For example, in dealing with monographs, the effort expended is likely to be proportional to the number of bibliographic items (or books, as we used to call them) processed. It would

TABLE 2
OVERHEAD RATES

<i>Service</i>	<i>Overhead</i>	<i>Base</i>	<i>Rate</i>
Periodicals	\$4,000	\$30,000	13.3%
Other serials	\$12,000	\$10,000	120.0%
Monographs	\$53,000	\$20,000	265.0%

make more sense to divide the technical services cost for monographs by the number of monographs processed (suppose it is 1,000) to come up with a figure of \$53 per item. If books were more expensive, for reasons not having to do with general price inflation, one would expect that the per book cost would remain the same rather than the cost per dollar spent on books. Similarly, if the cost of books were to miraculously drop, one would not project a drop in the costs of technical services.

Turning to periodicals, the natural unit of measure here is not bibliographic, but is most likely to be the number of single issues processed. Processing periodicals tends to go by the single issue as each is unpacked, checked in, and shelved. Thus it would seem sensible to attribute the cost of this processing to the individual physical issue received. Of course this would complicate life further down the line. Eventually most of the periodicals are drawn from the shelves, bound, and returned to use. In this case the cost of a bound volume would be some combination of the binding cost plus the cost assigned to the handling of each of the individual issues as it came in, plus of course the purchase cost.

Finally, books in series represent a perplexing issue as they seem to be "difficult" not necessarily in proportion to the number of series handled or to the number of volumes handled. Such things as changes in name and publisher and problems of effective cataloging make it hard to specify the natural base number by which the cost of processing ought to be divided.

Quality of Service

To this point the discussion has only been about the problem of assigning cost to a *quantity* of activity. Nothing has been said about the *quality* of that activity. Here, as discussed earlier for public services, there is both quality of process and quality of product. Quality of process (leaving aside the fact that most administrators do think of the cost as one of the qualities of process) boils down to the delays. In most libraries there is no analogue to the notion of availability—that is, the intention (or pretension) to eventually process every book or periodical that is received. The wisdom of this intention could be questioned as will be seen later.

Processing delays are defined by the interval between the time that material arrives in the mail room and the time that it is on the shelf and

in the catalog ready for the readers to use. Techniques have been developed and described elsewhere to measure these delays (Kantor, 1984). On the average these are performed quite easily. The essential fact is that delay is directly proportional to the size of the backlog and inversely proportional to the rate at which materials are processed. This assumes, as is usually the case, that there is a work flow (or several parallel work flows for various types of material), operating on a first in first out queue discipline. New arrivals go to the end of the list and wait to be processed in turn.

It is interesting to note that this aspect of quality—the size of delay—is in principle absolutely unrelated to the cost of technical services operation. As long as materials continue to be processed at the same rate, the cost of processing will not change. If materials are quite old, because there is a large backlog, they will be neither more expensive nor less expensive to process.

There is an exception to this rule. A certain fraction of materials requires original cataloging if cataloged at the moment received, but can be handled by copy cataloging after a suitable delay. This procedure, which has been instituted in an uncoordinated and ad hoc way by libraries around the country, is fundamentally unstable and uneconomic. It can be likened to a suburban community of homeowners all of whom decide not to buy lawn mowers because they intend to borrow from each other. The new initiative for nationally coordinated cataloging being developed by the Library of Congress, The Council on Library Resources, and Association of Research Libraries represents a first effort to control the potential instability of this situation.

Delay can be changed by one time administrative or procedural remedies not having any specific cost structure. One extreme is to hire a task force of part-time specialists to catalog all the books in the backlog. The cost of this is essentially proportional to the number of books, and therefore proportional to the size of the backlog, and finally proportional to the size of the current processing delay.

A second alternative is to place all of the books on special shelves available to the public, advertise their presence, and process only the ones that find their way into use. (This procedure was instituted by H.F. Johnson at Emory University in Atlanta under the clever name of “front log.”) The cost in this case is a simple one-time cost of moving the materials and advertising their presence, plus an amount proportional to the number of books in the collection that actually have value and are used. If the backlog collection fills a few hundred feet of shelves, there is reasonable probability that books of value will find their way into use. If it fills a warehouse sized room 200 feet on each side, without substantial partial cataloging, there is a good chance that much of it will not find its way into use.

Quality of Product

What are the quality features of the product of technical services?

One is correct handling of physical material (putting the right call number on, typing the correct characters on a card or in a database, putting a book onto a shelf in the place that its call number indicates, and so forth). These are straightforward physical processes and the error rate can be measured by taking a sufficiently large sample of work completed and carefully checking it for errors.

More difficult to measure is the quality of the intellectual processes involved in technical services. Primary here is cataloging—both subject cataloging and descriptive. In addition, there are related activities such as the assignment of a classification number and making necessary updates to and checks with various authority files. Thus the cataloging of a book results in the production of an intellectual product which is either a complete original cataloging record or a derived cataloging record sufficiently consistent with both national and local standards.

The quality of this type of work can also be measured, but only with difficulty. A substantial range of results could be considered completely acceptable, but some deviations must be regarded as "errors." Quality could be measured by the number of books handled for which the resulting records have no errors at all. On the other hand, one could distinguish between substantial errors (for example those that would significantly limit user access to the books) and stylistic errors (which represent deviations from practice having no foreseeable impact on the operation of the library). From this standpoint one would count an operation successful if it produced no substantial errors. Of course, substantial errors could act independently of each other, and one might want to develop measures which compare the number of substantial errors committed with the number of items processed. The number of substantial errors could be in principle larger than the number of items processed, which could result in a 120 percent error rate.

Quality and Cost

There is no generally accepted theory for how the elimination of errors, beyond the performance achieved by routine training and supervision, affects costs. There is certainly some law of diminishing returns, as it becomes more and more expensive to weed out an ever smaller supply of errors. One possibility is that, above some baseline performance, cost will increase in proportion to the number of records that don't have errors divided by the number of records that do have errors (Kantor, 1984). This suggests that going from a 4 percent error rate to a 2 percent error rate could double the cost. This will be called the "good-to-bad" ratio approach.

Another way of looking at errors is to suppose that errors arise not because of the intrinsic difficulty of the material but as a kind of random phenomenon. Thus if there is a 4 percent error rate it means that 96 percent of all the materials are being processed correctly. The cost could be doubled by processing everything twice (not assigning it to the same

people). Under this random error model, the error rate would then drop to 4 percent of 4 percent, which is less than 0.16 percent. Thus, according to what are considered the errors and how avoidable these may be, very different estimates are obtained of the relation between the quality of product and the cost of providing that quality.

Let it be noted that if the baseline performance figure was 60 percent, then under the ratio model, a doubling of costs would represent a rise to 75 percent. On the other hand, under the random errors model, doubling of cost could bring the percentage all the way up to 84 percent, nearly 10 percentage points higher. In this way, the good-to-bad ratio approach seems to provide a kind of upper limit for the cost of improving quality (Kantor, 1984).

COLLECTION DEVELOPMENT—AN INTERMEDIATE EXAMPLE

Collection development, which was conspicuously absent from the earlier cost pyramid, represents an interesting middle ground between technical services and public or access services. Like technical services, collection management has a fairly orderly work product—a set of purchase requests. Unlike technical services, it deals with a somewhat ill-defined body of potential work. In principle, any book or serial is a candidate for consideration. In some ways the quantification of work in collection development is even more difficult than quantification in the area of reference services.

It would be unreasonable to say that a collection management group that recommends the purchase of 1,000 items has done twice as much work as a group that recommends the purchase of 500 items. In fact, if both groups arrived at their results by carefully studying a list of 2,000 candidates, then the second group may have done 50 percent more work because they have eliminated 500 more items from the list. Or, perhaps they have done 50 percent less work by somehow easily skimming off the top 500 items while the other group struggled to allocate the rest of its budget by picking the best 500 from a not-too-attractive remaining list of 1,500 candidates.

Given that it cannot be known, from the number of items recommended, the amount of work done, it seems most reasonable to take as a base figure for the collection development activity the number of items "seriously considered for acquisition." The corresponding cost measure for this activity is the total cost of the activity divided by the number of items considered. Note that when cost is distributed over the materials themselves, this measure is of no use. Eventually the cost must be distributed over the items that are actually acquired with the understanding that it does not represent a measure of the performance of the collection development activity.

The quality of a collection development activity is measured in one way by standard surveys of library holdings. If a library of a given type is expected to maintain a certain list of core journals in a specialty or a

certain list of basic textbooks, then performance can be measured by comparison with those lists. Generally speaking, this tells more about the library's budgetary situation than about the abilities of its development staff. The lists are available to that staff who may not be able to buy what they need.

A totally different perspective is provided by considering the usefulness (that is, use) to the readers. From this point of view, the performance of collection development is measured by the number of use events generated by newly acquired materials during their first two or three years of existence. As with most aspects of a library, this cannot be taken in isolation. For example, the best collection policies in the world will not result in prompt use if technical services has a three-year backlog. The books simply won't be "out there" to be used. By the time they are available, particularly in the sciences, they may have passed their period of peak interest. Similarly, there may be items whose acquisition is important to the institutional mission (for example, because they are used by a key researcher or because they complete holdings in a recognized area of strength), but which are not heavily used after they are acquired.

With all of these misgivings, it would still be interesting for collection development offices to routinely scan the circulation activities and other use indicators for the materials that they recommend. At the very least, it might help to shape their perceptions of the needs of the collections user as perhaps opposed to the needs of "the collection itself."

This completes the preliminary survey of some of the problems and concepts that arise in performing cost analysis for technical services. This subject has been dealt with at length in Kantor (1986, pp. 221-86). The problem boils down to defining the overhead, defining the base, and dividing one number by another. There is, in principle, nothing difficult about it. There is, in practice, a double minefield of intellectual and political pitfalls. Some of the intellectual problems have already been surveyed in this discussion. The cost analyst must be prepared to make decisions that are somewhat arbitrary but defensible and then be able to defend them until better ones come along. The political traps are substantial.

Any cost figure developed at a library and made known to the library's friends and enemies can cause substantial harm. This is particularly true because there has been so little public discussion of costs and sharing of cost information. Any number can be made to look large by an outraged professor who would like to see more money spent on books. What he really ought to ask is whether that number is larger at his library than at another library and if it is larger at his library, is it buying more function or does it just represent poor practice.

The same can, of course, be said for performance measures themselves. There is a great fear that the release of any measure, such as an

availability figure or a delay figure, will be used to harm the library or to attack its present leadership. Manfred F. R. Kets DeVries of the European Institute of Business Administration reports that "a certain amount of paranoia is inevitable in the corporate world and to a certain point it is indeed adaptive" (Wray, 1989, p. 62).

The dangers in the political climate have held the development of performance measures and cost analysis to an absolutely glacial pace in librarianship. Russell Shank proposed, in the early 1950s, measures of availability and processing speed that were later rediscovered by the author (R. Shank, personal communication, 1976). The Public Library Association, in a pioneering effort to introduce analysis of performance and costs, found it necessary to break the ice with a weighty manual (Palmour, 1980) on planning processes with little more than passing reference to the measurement of progress toward objectives. Successive volumes have dealt with the introduction of objective performance measurements in public libraries (Zweizig & Rodger, 1982) and with library costs (Rosenberg, 1985). Unfortunately, even with the advent of a major coordinated work on planning, measurement and evaluation (McClure et al., 1987; Van House et al., 1987), there are still serious gaps in the literature. These have to do with assigning costs to the services that the library provides in a way that makes sense to both the users and librarians, the subject of this article.

The Association of College and Research Libraries has also moved into the arena with the development of a workbook on performance measurement (Van House, 1989, in preparation) which stands somewhere between the PLA's effort and the book published by the Association of Research Libraries (Kantor, 1984).

ASSIGNING COST OF LIBRARY OPERATIONS TO VISIBLE ACCESS SERVICES

When the costs assigned to individual services are multiplied by the number of service events in a year and the results are added, these must equal the total operating budget of the library. Such an assignment of costs is considered "fair to the library." This is exactly the same principle that is used by the U.S. government in reviewing costs in a contractor's proposal. The government does not ask whether the contractor is spending money wisely but simply asks how it is being spent. Presumably the government's protection from contractors who spend money unwisely is that they submit higher bids and are not selected. It is worth noting that in the library world this very important control over "contractor foolishness" does not exist. There are no situations in which, for example, a major university publishes a request for proposals for the management of its library and evaluates more than one option. Generally it reviews this year's budget request, comparing it with last year's budget request and this year's total university budget. This lack of a "competitive market place" makes possible the survival of enormous

disparities in the cost of essentially similar operations at different libraries.

Once "fair" costs for services are arrived at, it is important to realize what they are not. They are not the kind of "purchase price" that can be used without reservation to project future budgets. For example, if it is found that the present cost assigned to a circulating book is \$3.07 per circulation, it could not be projected confidently that if there are 2,000 more circulations next year it will add \$6,140 to the library's operating cost. Such a projection cannot be made because there are enormous interdependencies in the effects of library activities. The figure for the cost of circulation includes, as shall be seen, something of the cost of buying and cataloging and shelving the book that circulates. These costs are "sunk" and if no more books are bought in response to the greater circulation next year, the only additional costs will be the directly attributable costs—i.e., check out and reshelving.

It is sometimes argued that for this reason only the directly attributable costs should be allocated to services and the entire cost of acquiring and organizing the collection should be treated as a capital investment (Hayes, 1979). As attractive as this argument may be, it does not seem possible to apply the other usual techniques for the accounting of capital investment (such as the cost of money or concepts of depreciation) to the book stock. For this reason, accounting all of the expenditures as current expenditures is preferable (Rosenberg, 1975).

Of course, when projections must be made, a complete functional cost analysis will have the necessary information. The cost assigned to a circulation will consist of the fixed or sunk part and the variable part, and in a projection it is the variable part that should be used.

The general approach to library cost analysis proceeds in two steps. First, determine a total cost of a particular information-bearing item: a book, a periodical, a purchased database, and so forth. This assignment is based on the principles described earlier. It includes the purchase cost plus a reasonably allocated share of the processing costs. It has already been noted that most of these costs arise not because of the need to physically install the object in a library, but because of the need to intellectually install it with the creation of appropriate bibliographic control. The payoff for all of this effort lies in the actual use of the items.

Circulation

For any particular kind of use event, such as a circulation, the per event cost of the book must be added to the per event cost of maintaining and operating the circulation system, and stacking and reshelving books. The second part of this sum is easy. The total cost of the circulation department (which is almost entirely in salaries and software/hardware costs) is divided by the number of circulations per year. The difficulty lies in dividing the cost of a book by the overall number of

uses which requires definition of what is meant by a use and what is meant by the overall number of uses.

The costs of the public services are interlinked through the fact that these services all make use of the same body of materials. (Of course there might be a separate collection of materials which is only used for reference support. That cost would simply be added to the direct costs of salaries, software and hardware in determining the per use cost of reference service.) What is meant by "a use" of a book and how are those uses to be compared across the various modes of access (photocopy, circulation, in-house use, reference use, etc.)?

Book Use Equivalency

It was suggested many years ago (Hamburg et al., 1974) that the natural unit of measure is the amount of time that the patron or end user spends in direct interaction with the book. Thus, if I read one book for three hours, while you read another for one hour, I have received three times as much "book use." This is an attractive idea, particularly because it squares very well with the notion that the patron expresses his evaluation of an item by continuing to use it. But, if a book is poorly organized, so that it takes three hours to dig the answer out of it, I might feel that I have not received three hours of *service* but that the three hours represent an added *cost* to me. In addition, books are used in varying ways to satisfy varying needs. In the case of a novel, unless I am preparing a particularly superficial book report, I expect to read the whole thing to derive whatever value it presents. A dictionary is used in quite the reverse way. For online fee-for-time services, that fee may be taken as an indication of value to the end user. But for access to subsidized services, one faces a problem essentially the same as for book use.

The key to allocating the cost of materials among various types of access is called Book Use Equivalency (BUE). Rather than base BUE on the amount of time that the user spends in contact with the book, it is based on the principle of "use until satisfaction." This asserts that the user, freed from other restrictions, uses a book until he has the answer to his question. What this means is that "one user's completed book use" is the same amount of service as "another user's completed book use" even though it is a different book, and it took a different amount of time to complete.

To allocate the cost of books requires the total number of book use events that occur during the year. Usual library statistics report circulations per year, interlibrary loans per year, photocopies per year and so forth. The BUE converts these to a common measure. For most services the BUE is very simple. The photocopying of a single item, be it one page or fifteen pages, represents one book use. The circulation of a book represents one book use. An interlibrary loan represents one book use. On the other hand reference service, in which a staff member assists the

user in finding information, typically requires the use of more than one book. A small sampling study may be done in the library. Details of all of these study techniques are presented in the FUNCOST Manual (Tantalus, Inc., 1986a). Such a study will typically reveal a value somewhere between one and three books consulted per reference engagement. Suppose for convenience that the number is two.

Similarly, a person who is studying the library's books in-house (without checking them out), is generally found to use more than one book in an hour. It turns out that it is much easier to measure the total time that patrons spend in the library reading the library's books than to directly count the number of books used (Tantalus, Inc., 1986b). The equivalency is established by controlled reshelfing studies coupled with interviews, as appropriate. In typical studies, it was found that the number was approximately three books used per hour of in-house reading. (If this number seems high, recall that most users who intend to spend a good deal of time with a book will do their best to borrow it and take it to a comfortable location.)

To be definite, refer to the figures in Tables 3 and 4. The total materials costs burdened by technical services is \$129,000. The use statistics are 18,000 circulations per year, 12,000 reference queries, and 10,000 hours in-house. Doing the multiplications shows that the total book use equivalency is 72,000. Thus, a single book use, fully burdened, works out to a cost of \$1.79 (see Table 5).

Consider these statistics in more usual terms. The 18,000 circulations represent about 360 books circulated per week (allowing for two holiday weeks in the year) or about 60 per day. The reference load is distributed over perhaps 2,000 hours a year during which reference service is provided. It represents an average of about six queries per hour. Since the focus is on informational rather than directional queries, this represents a load that may require more than a single reference librarian. Finally, the 10,000 hours of in-house use represent, when divided by a presumed total of 3,000 hours that the library is open, an average of three and one-third people reading the library's books in the library at any time. There may be more people in the library than this, using the catalog, reading their own books, or eating lunch.

From this point it is straightforward to calculate the costs to be assigned to each type of service (see Table 6). The circulation load described represents a total salary cost of \$18,000. A figure of \$5,000 represents hardware/software costs. Accounting hardware/software costs is something that won't be examined in detail here. Essentially the purchase price of software should be amortized over a reasonable number of years, not less than three but probably not more than five. Similarly the price of hardware should be amortized over that period. The cost of \$5,000 a year might represent something like a \$20,000 system with a \$1,000 annual maintenance contract (\$20,000 divided by 5 equals \$4,000 per year amortization plus \$1,000 per year maintenance equals \$5,000 per year).

TABLE 3
BURDENED COST OF MATERIALS

Technical services	69,000
Materials cost	60,000
Total	129,000

TABLE 4
BOOK USE EQUIVALENCY

<i>Service</i>	<i>Level</i>	<i>BUE</i>	<i>Product</i>
Circulation	18,000 circ	1 c	18,000
Reference	12,000 qrys	2 q	24,000
In-house use	10,000 hrs	3 h	30,000
Total			72,000

The total directly attributable costs for circulation is thus \$23,000 and is to be divided by the total number of circulations (18,000) to produce the directly attributable cost of \$1.28. The sum of the cost of book use (\$1.79) and the directly attributable cost is \$3.07, the functional cost of circulation at this library for the year (see Table 7).

Once again, be warned that this is the cost which must be recovered if the library is to pay all of its expenses. It is not necessarily the cost that would be saved if circulation is reduced by a few thousand nor is it the increased cost that would be experienced if circulation increased with other things remaining fixed.

Reference

Turning to reference, suppose that the direct cost of the reference department is \$80,000 in salaries plus a \$20,000 current expense on specific reference materials for a total of \$100,000. This is apportioned onto the 12,000 reference queries giving an average of \$8.33 in directly attributable costs. To this must be added the book use cost which is \$1.79 per use cost times an average of two uses per query or \$3.58. The total, \$11.91, represents the cost per reference query.

In-House Use

The directly attributable cost for in-house use is very small. Suppose the library has a reading area of 600 or 700 square feet with a few tables and chairs. Reasonable rental cost or equivalent value for that space and furniture might be \$12,000 per year. This is divided by 10,000 hours of use to give a figure of \$1.20 in directly assignable costs for the use of the space and furniture. To this must be added however the book use equivalency value of the three books used per hour—\$5.37. Thus the total cost per hour of in-house use is \$6.57 (see Table 7). The numbers

TABLE 5
UNIT COST OF BOOKS PER USE

Burdened cost of materials	\$129,000
Total usage in BUE units	72,000
Unit cost	\$1.79

TABLE 6
DIRECT COST CALCULATIONS

<i>Service</i>	<i>Annual</i>	<i>Events</i>	<i>Per Event</i>
Circulation	\$23,000	18,000 circ	\$1.28
Reference	\$100,000	12,000 qrys	\$8.33
In-house use	\$12,000	10,000 hrs	\$1.20

given here are not unreasonable, but this is entirely a made up example (for a survey of some real world data drawn from academic libraries, see Kantor, 1986, pp. 221-86).

It is interesting—one might almost say striking—that what appears to be the most free use of the library—simply sitting and looking at books—is quite expensive on a per hour basis. Of course an hour of reference consultation would be even more expensive, but most engagements don't last nearly that long.

Reconciliation

Do these costs represent a fair account of the library's budget? The calculational check is shown in Tables 8 and 9, where each service is represented by the product of the activity per year and the assigned average cost recovering the total budget of \$264,000. This completes the example of cost analysis.

DISCUSSIONS AND PROSPECTS

The same techniques used here can be applied to an analysis of any of the library's complex activities. The example given has all the important features: a shared resource (the books) which involves both direct purchase costs, treated as a current expense, and a burden of processing costs. It involves the allocation of this shared resource among several types of activities requiring development of an equivalency ratio applicable to each of the types of activity. In this case the basic unit was called a book use, and a cost assignable per book use was derived. Exactly the same principle could be applied to develop a cost for audiovisual equipment, computer resources, online databases, and so forth. One verifies that the assignment of resource use costs, based on the equivalency, plus the direct costs yields a fair cost for the service itself by

TABLE 7
FULL COST CALCULATIONS

<i>Service</i>	<i>Direct</i>	<i>BUE</i>	<i>BUC</i>	<i>Total</i>
Circulation	\$1.28	1	\$1.79	\$3.07
Reference	\$8.33	2	\$1.79	\$11.92
In-house use	\$1.20	3	\$1.79	\$6.57

TABLE 8
RECONCILIATION

<i>Service</i>	<i>Annual</i>	<i>Unit Cost</i>	<i>Product</i>	<i>Direct</i>	<i>Breakdown Book Use</i>
Circulation	18,000 circ	\$3.07	\$55,250	\$23,000	\$32,250
Reference	12,000 qrys	\$11.92	\$143,000	\$100,000	\$43,000
In-house use	10,000 hrs	\$6.57	\$65,750	\$12,000	\$53,750
Total			\$264,000	\$135,000	\$129,000

TABLE 9
RECONCILIATION

<i>Service</i>	<i>Annual</i>
Circulation	\$23,000
Reference	\$100,000
In-house use	\$12,000
Sub total	\$135,000
<i>Burdened Cost of Materials</i>	
Technical services	\$69,000
Materials cost	\$60,000
Sub total	\$129,000
Total	\$264,000

checking that the sum of all assigned costs returns the total operating budget.

This analysis can be used to explain costs and to justify costs in terms of operations. It cannot be used directly for projection. If the cost of adding another 2,000 circulations must be projected, look to the *direct* cost portion of the circulation activity which is only \$23,000 and project an additional \$2,560 in costs. (All of this, of course, must be adjusted for inflation in a real world.)

Functional cost analysis can be useful to a library manager in comparing the current year's activities with last and in explaining the

relation between the library's large cost of operation and that small tip of the iceberg that is visible to users. There are not yet standards and norms for operating costs. The development of these is by no means an armchair exercise, nor can it be done by a standards committee. It requires the diligent development and sharing of accurate, reproducible cost analyses among peer groups of libraries. The principles outlined in this article should make it easier for groups of libraries to undertake this activity.

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Managerial Accounting and Changing Models of Administrative Behavior: New Methods for New Models

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ABSTRACT

THE PURPOSE OF THIS ARTICLE is to provide a description of the model of administrative behavior found in agency theory as contrasted with earlier models of administrative behavior, and to introduce new managerial accounting techniques that can be used to evaluate upper-level administrators in a nonprofit organization such as a library. In addition, the article outlines several problems with the orientation of managerial accounting as a viable means of evaluating higher-level administrators through the use of the administrative model described in agency theory.

INTRODUCTION

Managerial accounting is concerned with collecting information for use in making operating decisions by higher level managers within a library system. These library managers have the authority to make changes in the manner in which library functions are performed. Managerial information can be historical data, or it can be estimates collected for making decisions that affect the future. In either case, information is collected and presented in a format that is helpful to the operating manager in making decisions. In preparing managerial reports, there is little concern with the manner in which financial statements are prepared for the external public or the board of directors. External financial reporting does not influence managerial reports prepared for internal use.

Managerial accounting can encompass three basic areas in the

library. Accounting information can be prepared for cost control, performance evaluation, or making decisions that affect the future. The major emphasis in this discussion is on the performance evaluation of higher level administrators. But it should be noted that each of the three areas of managerial accounting overlap, as successful cost control can affect one's performance evaluation, and decisions that change the future course of events eventually impact on one's performance record.

Basic to recommending a performance evaluation technique is a behavioral model of the executive or administrator. Relatively recently, in agency theory, the concept of the administrator has been redefined. As such, agency theory impacts on the performance evaluation methods used in managerial accounting—i.e., post- versus pre-agency theory methods. Most methods used in managerial accounting for evaluating administrative performance predate the development of agency theory, and little development of new methods has occurred since administrator characteristics in agency theory have been set forth. Therefore, most of the managerial methods used for performance evaluation do not incorporate the concepts of managerial behavior as described in agency theory. As a result, the actions and decisions made by upper-level administrators cannot be fully analyzed to determine if administrative behavior is oriented toward furthering the manager's interests at an unnecessary cost to the nonprofit organization or if the manager is genuinely attempting to achieve organizational goals.

Under agency theory, it is assumed that the managers—i.e., the agents—of an organization have a tendency to be primarily concerned with their own welfare. This means that the objectives of the managers and the objectives of the organization may not coincide. Although this may be a disagreeable assumption, anyone who has used library supplies for personal purposes or who is aware of others doing so has contributed to an increase in agency costs or experienced the basic premise of agency theory. Agency costs are equal to: (1) the costs incurred in monitoring managers to ensure that they are pursuing the goals of the organization rather than their personal goals—i.e., the costs of auditing the organization; (2) bonding costs which are the costs of purchasing insurance bonds that will reimburse owners if losses should occur because the manager pursues his/her personal goals rather than organizational goals; (3) the actual losses which the organization suffers due to the manager pursuing personal goals—i.e., the loss of library supplies. In a library, monitoring costs and losses are the two major agency costs to consider.

Briefly described, agency theory views the organization as a series of contractual relationships between principals (owners) and managers (agents) each of whom is motivated by self-interest. The contract between these two groups is designed to maximize benefits to owners within the constraint of the manager's self-interest goals. Agency theory is concerned with employment contracts, determining who has access to

organizational information, and the welfare of organizational members. Agency theory assists in identifying increased operating costs to owners—i.e., users or receivers of library services—due to negative behaviors exhibited by the managers in charge of the organization. Agency costs include the costs of monitoring the activities of the managers of the library—audit fees for example—to ensure that the greatest level of service is provided. Agency costs also arise from losses in resources that occur because managers are more interested in fulfilling their personal objectives rather than the organization's objectives. These additional costs reduce the level of services the library is able to provide out of a limited resource base.

MODELS OF ADMINISTRATOR BEHAVIOR

Two major works describe administrative behavior prior to the development of agency theory. The first description was made in a series of lectures delivered by Chester I. Barnard who described an ideal executive as an economic rational man. The second significant contribution to this area is the work of Herbert A. Simon which replaced the model of the administrator as a completely rational man with a description of the administrator as a man with "bounded rationality." In the bounded rationality model, the administrator or executive did not have the ability to reach the best solution to a business problem. There were limits to the executive's abilities.

In 1938, *The Functions of the Executive*, a collection of Barnard's lectures, was first published. This work describes the job of the executive and identifies the characteristics essential for executive success. One aspect of this work discusses the moral responsibility of the executive. Essentially, moral responsibility determines the manner in which an executive acts.

One important part of this moral fabric is identified with the organizational environment. Yet, as various codes of conduct internalized by the executive become more complex, there is likely to be more conflict among these codes. An organizational code requires an individual to submit to the authority of the organization in achieving the organization's goals. Yet personal codes can conflict with the organizational code, and this can result in a failure in the moral responsibility of the executive or possibly separation from the organization. Barnard (1972) identified the conflict of goals that can exist in the organization when he stated that, "frequently the leader believes his personal morality and that of his organization are identical when they are not" (p. 283). Although Barnard was aware of the conflicts that could exist between personal codes of conduct and organizational codes, he stopped short of describing the dysfunctional behavior which could arise since his main concern was describing the ideal executive.

The ideal executive was loyal to the organization and believed that through achieving organizational goals, personal goals would also be

achieved. Barnard's abstraction of the ideal executive represented someone with the ability and skills to succeed. There was little question about the executive's skill or abilities to reach the best managerial decision.

Simon (1959) took a different approach to describing the executive. He viewed the executive as "a satisficing animal whose problem solving is based on search activity to meet certain aspiration levels rather than a maximizing animal whose problem solving involves finding the best alternatives in terms of specific criteria" (p. 277). Simon did not assume the executive would always reach the correct decisions. Simon recognized that no one can find *the* optimal solution for the whole decision problem. Usually decisions are made without considering all alternatives or the interrelatedness of the decision's effects. Simon recognized that there were limits to the decision-making process. These limits are imposed by the executive's skill or mental abilities, values, and the amount of information available. Simon's executive operated within certain bounds of rationality. This executive is not the ideal rational executive described by Barnard. Simon's executive makes decisions that are adequate or pretty good but not the best.

The writings of these two authors on administrative theory differ in their basic orientation. Although Barnard was aware that not all executives could be the ideal executive, he directed his lectures toward describing that ideal. Implicitly, this executive could reach the best solution to a managerial problem. Simon did not concentrate on the ideal executive, but rather wrote about the executive who could never reach the ideal solution because he readily accepted merely satisfactory solutions.

Both Simon and Barnard accepted the abstraction that, once an individual decided to participate in an organization, personal considerations would have little effect on the administrator's behavior within a defined area of organizational activities. Agency theory, however, does not accept this view of the administrator. In agency theory, a more descriptive model of the administrator is developed. Although the agency model may appear as an extension of Simon's model of administrative behavior, it incorporates political and new behavioral considerations not found in either of the other models (for a description of agency theory see Fox [1986, pp. 36-38], Thornton [1984; 1985, pp. 93-100], and Jensen & Meckling [1976, pp. 305-60]).

Unlike a descriptive model, a normative model incorporates the best analytical techniques in solving a managerial problem, but it does not incorporate variables such as the political environment and behavioral considerations which are very real factors to a nonprofit administrator (Tinker et al., 1982). The basic premise of agency theory is a descriptive model in which the organization is managed by someone other than the owner, with the result that such managers will tend to pursue their self-aggrandizement goals rather than acting strictly in the owners' interests. These organizational relationships are assumed to be

bound together by a series of contractual relationships. In the simplest contractual relationship, a contract is signed between the owner and the manager for the performance of some service. At the same time, decision-making authority is delegated to that manager by the owner.

In nonprofit organizations, the manager or agent is the director, and the owners are either the groups that provide monetary resources or, in some cases, the group which is receiving the service. In a library, an agency relationship can exist between the director and the board, the director and the government entities providing funding, and the director and the service groups. In any case where authority or work is delegated, the agency relationship—i.e., a contract—is assumed to exist. Therefore, when the director delegates authority to a department head, agency concepts apply to that relationship as well.

In these relationships, it is assumed that the managers or agents are trying to maximize the benefits for themselves. Under agency theory, the concept that the manager foregoes personal considerations in favor of organizational goals is not accepted. An important principle of agency theory is that individuals possess unequal amounts of operational information. The agent has more information about actual operations than the owner and can therefore make decisions for personal benefit without the knowledge of the owner.

Under agency theory, consideration is given to the opportunism of managers in charge of departments and organizations. Opportunism means that a manager will select the solution to a problem that is in his/her best interest but not necessarily in the best interest of the organization or the group to whom the organization is providing services. For example, the best solution for a manager may mean exercising the least amount of effort—i.e., shirking. The lack of congruence between shirking and service goals should be a concern in a library. To assume that a manager's attitude toward accepting higher levels of career risk in order to provide better services, the manager's personal ambition, or the prestige attendant upon a position are not factors in the decision-making process is unrealistic. Yet even if these factors are recognized, it is difficult to assess their impact on the "hard" data in managerial reports.

It should be noted that a great deal of the so-called "hard" data in managerial reports are based on estimates which in turn may be biased due to behavioral effects, but this bias is difficult to detect. Because it is assumed that the manager in direct control of an operation has the best information about the situation, it is difficult for a supervisor or others to determine if the best estimate is really being made or whether the estimate has been biased to make the manager look better or to elicit more resources for the facility. The estimates that managers are called upon to make can relate to the time needed to finish a project, the personnel required, or the amount of use a new service will receive. The degree of personal bias introduced into these estimates is difficult to

isolate as evaluative information is only received after the action has been implemented—sometimes long afterward if ever.

The administrator who contrives may misappropriate organizational resources for personal use or may simply make decisions that further personal interests and waste organizational resources in the process. As an example, consider the administrative perks that might be available at some nonprofit organizations such as free long-distance telephone calls or travel reimbursement. The major question is "Are these organizational resources being consumed for personal use?" Personal consumption can take the form of vacationing under the guise of conference attendance or using free long-distance telephone service to call family members. In a library, misappropriation of organizational resources by managers occurs when library equipment is used for personal reasons for extended periods, when deaccession of books occurs in order to use these volumes in the home library, or when library personnel are used to complete personal projects for an administrator.

Behavioral contrivances can take the form of enhancing the status of the administrator without any commensurate benefit to the organization. For example, in a period of fiscal austerity, an administrator may use current expense money for an extravagant Christmas party which coincides with the administrator's birthday and includes arrangements to fly distant relatives in for the celebration. As another example, assume that a library director is on a highly upward career track. In accepting a new position, this person is mainly concerned with how the accomplishments on the new job will impact the next promotion. Since the director's accomplishments are all oriented toward building a short-term track record, the decisions he/she approves are only those which enhance that short-term performance record. For example, computers may be installed so that the director can list the development of a computer initiative on his/her résumé. In implementing this initiative, the cheapest computers are purchased, and, as a result, there is no maintenance agreement, little software, or no technical support. The computers are of little real use to the staff or the public. Worse yet, they will have to be discarded after two years of use. Yet this is not important to a library director who can list the computer initiative on his/her résumé and move on to a new higher-paying position before the actual nature of the computer initiative becomes apparent. There is disagreement in agency theory as to whether the job market is highly informed enough to act as a self-regulating device on managers who exhibit this behavior (Williams & Findlay, 1983, p. 44).

In managerial accounting, one area of continual analysis is the evaluation of administrator performance, but the abstraction found in Barnard (1972) and Simon (1959) concerning managerial behavior remained the basic underlying assumption—organizational resources were not consciously consumed in the furtherance of personal goals and self-aggrandizement. Also, implicit in Barnard's lectures was the

assumption that the manager could reach the correct decision. In contrast, Simon assumed that the manager was unlikely ever to reach the optimal solution to a problem because of his/her limited abilities and skills. More recently, in agency theory, the manager is conceptualized as an individual who is mainly interested in satisfying personal and not organizational goals. Administrative behavior in these three models spans fifty years and shifts over time from Barnard's view of the ideal executive, to Simon's view of a marginally competent executive, to agency theory's view of an executive who is largely oriented toward self-interested goals which generally do not correspond with organizational objectives. It is difficult to determine whether this change in perspective is a reflection of a change in society—i.e., the “me” generation—or the realistic recognition of characteristics that were always present.

But when agency theory is introduced into managerial accounting, new cost-effective techniques need to be developed to monitor self-serving managerial behavior, and the increased costs of this monitoring must be continually balanced against the wasteful loss of organizational resources. The agency model provides a description of managerial behavior that has a direct impact on the value of managerial accounting information. For example, managerial accounting information collected to evaluate performance is not cost free; therefore, it should effectively identify self-serving managers. If managerial accounting information used for evaluation purposes, especially information based on pre-agency concepts, does not assist in identifying the self-serving managers described in agency theory, the cost of collecting this information is also a waste of organization resources. Agency theory forces practitioners to place a value on managerial accounting techniques with regard to a defined objective.

Even if it is agreed that managerial monitoring should be instituted, it is still difficult to monitor administrative behavior in a non-profit organization. For example, if the director of a library is sitting behind a desk reading newspaper comics, how is this observable? And is this behavior decreasing productivity or providing a break after which productivity will increase?

Although techniques that have been used in the past may be adaptable to agency theory, they cannot simply be applied to observed practice without questioning their value (Baiman, 1982, p. 206). It should be noted that many of these older techniques were directed at providing Simon's manager with information to make better decisions and not directed at identifying self-serving behavior. The next section is concerned with introducing two new managerial accounting techniques that are specifically directed at incorporating agency theory into managerial accounting. These methods are limited to evaluating the performance of higher level administrators.

AGENCY ACCOUNTING TECHNIQUES

In agency theory, two general behavior patterns can be described as

exhibiting self-interest above organizational interests—shirking and behavioral contrivances. Shirking is exhibited by minimizing work effort. The second pattern occurs when the manager contrives to place self-interest above organizational goals. Contriving behavior occurs when actions are taken that are not in the best interests of the organization or when actions are not taken when they should be. Managerial accounting concentrates on several, but not all, aspects of this dysfunctional behavior. In detecting shirking, managerial reports are useful if the work is a highly structured activity such as book shelving or cataloging (Tiessen & Waterhouse, 1983, p. 256). Managerial accounting is less successful in detecting shirking when the work activities are not highly structured as is the case with most functions performed in higher level administrative positions. In these cases, there is imperfect data about the level of effort expended, and here the tools of managerial accounting have not worked as well.

Nonetheless, managerial performance reporting can highlight shirking and behavioral contrivances. Managerial accounting techniques oriented toward measuring behavioral contrivances by administrators are particularly successful in measuring the results of activities that have been completed. These managerial actions are recorded by the accounting system, and the costs associated with them or the level of services they provide can be determined. In the prior example of the library director who instituted a "computer initiative," the cost of the equipment is recorded, and it is a matter of proper and timely reporting to judge whether or not the service provided is adequate.

But, as Moliere said: "It is not only what we do, but also what we do not do, for which we are accountable." Managerial accounting has more difficulty in providing timely reports about administrator actions that were *not taken*. There is less accountability for actions not taken, and, when it is reported, there is usually a considerable time lag between the event and the report. For example, the effects of lack of maintenance on a facility—i.e., leaking roof, cracked pipes—are usually reported when water damage becomes apparent and this may be years after maintenance was curtailed. Timely reporting of maintenance expenditures is important to identify quickly the higher administrative level where the responsibility for the decision is located.

Efforts to correct these reporting weaknesses and to provide better managerial information increase costs. Collecting information to monitor behavior is not cost free. The question that remains is how to best incur these additional monitoring costs? It has been suggested that administrative compensation packages be designed so as to reduce monitoring costs (Fama, 1980). Such contracts allow an agent to share the output—i.e., risk sharing—of the organization in a way that provides congruence between the goals of the organization, its owners, and the agent. This arrangement allows the manager to share not only benefits but also the risks of running an organization. This method,

although acceptable in a corporate environment, is difficult to apply effectively in a library setting where compensation is set at a fixed budgeted amount.

Similar suggestions have been made to control shirking behavior. These recommendations have been applied on budgetary slack—an aspect of shirking. Budget slack occurs when there is more money allocated to an operation than necessary. As a result, it is not necessary to be concerned with the efficiency of operations. It has been suggested that budget slack can be eliminated by using participative budgeting and pay schemes tied to the budget (Chow et al., 1988). This method may have implications for nonprofit organizations, but the results are preliminary and difficult to implement.

Both of the earlier suggestions attempt to reduce monitoring costs by relating them to pay schemes, but a nonprofit organization, such as a library, provides fixed compensation to its employees. In addition, many employees may be tenured. Therefore, monitoring costs in a nonprofit organization need to be kept to a minimum by using information about the activities of higher level administrators that can be easily collected.

There are several suggestions and ways to incorporate agency concepts of administrative behavior into managerial accounting without incurring excessive expenditure. These methods are concerned with monitoring administrative shirking behavior or behavioral contrivances that are associated with actions not taken by higher level administrators rather than with those implemented. These are: (1) performance audits; (2) recording deferred items; and (3) value lost determinations.

Performance Audits

A performance audit differs from the annual financial audit performed by a certified public accountant (CPA). In the financial audit, the CPA checks for reasonable assurances that the financial statements prepared by the nonprofit organization comply with proper accounting standards for external reporting. Unlike a financial audit, a performance audit can either have a management or a program orientation. A management audit is performed to reasonably ensure that operations have been carried out efficiently and economically. A management audit investigates any of the activities conducted in the organization—from purchasing equipment and supplies to evaluating expenditures on interviewing candidates for a new library position. Even gas purchased for a bookmobile could be analyzed to determine if it was purchased from the most economical source.

A program audit, the second type of performance audit, determines whether the specified program objectives have been accomplished as prescribed. A program audit is conducted to determine if prescribed library policies were carried out, and if they achieved their intended results. The program audit lays more emphasis on program effectiveness.

Performance audits provide the means to integrate the principles of agency theory into management reports. In a library, it is often difficult to determine if management is shirking on the job. One factor in making this judgment is to find how successful management is in following policy initiatives. Policy initiatives can be established by the board for higher-level management or they can be set by higher-level management for the mid-level managers to follow. A performance audit should provide evidence as to how well management is performing. Yet it cannot be said that the negative behaviors described in agency theory will be clearly highlighted by the *typical* management or program performance audit, but the suggestions made in this article for changes can assist in identifying them. With these modifications, performance audits can significantly contribute to identifying administrative shirking or behavioral contrivances.

If a library is part of a state and local government, a performance audit may be performed for the library by the internal auditors who work for the state or local governmental unit. In the federal government, the agency responsible for performing performance audits is the General Accounting Office (GAO). Many states have similar agencies which are responsible for a performance audit. Therefore, it may be relatively easy for a library board to request that a performance audit be conducted, and it may be a cost free service for the library.

Recording Deferred Items

The main emphasis of managerial accounting is reviewing actions that were taken by managers. For example, if a new program is started, cost data on that program are analyzed in great detail. Managerial accounting also helps in making choices about future-oriented decisions as when it is necessary to choose between two types of similar equipment. But managerial accounting does not deal well with the impact of actions not taken. When no action is taken to maintain assets, managerial accounting does not identify this decision in a timely report. When no action is taken to train employees in the latest technology so that better services can be provided, this is not reported. Obviously, contrivance behavior can be related to actions not taken especially when a calculated decision is made not to take action. In many cases, managers should be held accountable for decisions they did not make just as they are held accountable for those they did. In the United States today, calculated decisions were made not to maintain state and local government infrastructures, and as a result bridges and roads are collapsing. Suddenly the public is faced with the choice of spending hundreds of millions of dollars to repair these facilities, and no managerial report showed, at the time, that a calculated decision was made to forego maintenance expenditures on these facilities. Managerial information should provide information to the board and to the community about

the choice—i.e., no action—made by nonprofit managers at the time the choice is made.

The same problem can exist within a library if its facilities are not properly maintained. One common problem with budget cuts is that the costs allocated for maintenance are the first to suffer. Maintenance cuts made in order to achieve other policy objectives are likely to go undetected in a typical performance audit. Therefore, it is suggested that reports be prepared, either in a performance audit or as part of the managerial accounting system, to show clearly expenditures required for maintaining assets in good working order. These amounts should be compared with expenditures actually made to determine variances.

Information from vendors should be available regarding the amount of yearly maintenance charges needed to properly maintain equipment and other assets. Maintenance charges for properly maintaining capital assets such as buildings and vehicles can be estimated. Using these data and the amounts actually spent, a yearly deferred maintenance charge can be calculated. The concept of deferred maintenance is different from depreciation. Depreciation involves allocating the cost of an asset to the various time periods that are benefited by the asset. Deferred maintenance, on the other hand, is equal to the difference between the amount of maintenance that is actually expended on an asset and the amount that maintenance guidelines indicate should be expended on the asset. If less is spent than should be expended, the difference between the two amounts shows the amount of curtailed maintenance expenditures. The yearly balance in the deferred account decreases or increases depending on whether there was a positive or negative difference between the annual amount spent and the amount that should have been spent. If the amount of curtailed maintenance expenditures is increasing, it is likely to be a sign of prematurely deteriorating assets.

Over the short term, it may be possible to curtail maintenance expenditures and use that money for new initiatives in the library. Such efforts make a library director appear to be a dynamic leader. If the director is able to find a new position before deterioration becomes apparent, these problems will be passed on to his/her successor. In order to prevent facilities from deteriorating to the point where they have to be prematurely replaced and to detect this type of administrative contrivance behavior, deferred maintenance should be clearly reported. Reduction or curtailment of maintenance expenditures is an example of actions not taken by management, and one that is not reported on a timely basis in traditional managerial accounting.

Reporting on the level of asset maintenance is suggested as a means whereby one type of contrivance behavior can more easily be recognized. It may be that a manager has to make a choice between drastically cutting maintenance or services, but, regardless, this information should be known. It is likely that current savings in maintenance costs

will result in unanticipated increases in future costs. The issue of maintenance is as important for the employees as it is for the equipment and buildings. Human resources—one of the most important assets of a library—can deteriorate almost in the same way as physical resources—e.g., obsolescence of skills. Unless funds are allocated to maintain the skills of personnel through seminars and workshops, it is extremely difficult to introduce new technology or methods in the library. Therefore, there is an annual maintenance charge for human as well as physical resources.

Value Lost Determinations

Value lost determination is another method that can be used where it is difficult to measure administrator input and monitor his/her activities. It is specifically directed at actions not taken by an administrator as is the reporting of deferred maintenance. Value lost determination is not a method to use with those employees who process books, work case by case, or where output can be clearly seen and measured. It is a procedure to use in making a determination of the value lost from lack of administrator input. Lost value may occur because of shirking or possibly misdirection. In making a value lost determination, one asks, "Is there any value lost to an operating activity because an administrator did not become directly involved in the decision process?" Value loss relates to losses to the public or the organization in terms of service levels. In other words, if an administrator had been directly involved in problem definition, identifying choices, and final selection of a solution to a problem, would better results—i.e., service levels—have been the consequence? The question is not directed at determining that the *best* solution would have been reached, only a better solution to the problem. Although it probably should not be assumed, it is assumed that administrator expertise and input to a problem leads to better problem resolution. With this assumption, the question can be answered in two ways.

The first answer is, "No value was lost"—i.e., no value would have been added—from administrator input into the problem. For example, if the administrator had no input into the work activity and the work activity was completed successfully, then the answer is "zero, no service value lost." In the day-to-day decisions that are made in purchasing books in a large library the director has no daily input in the selection activity, and the books are properly purchased. Therefore, the value lost from not having the director influence the choice of books or the vendor is zero. There has been no loss in service value to the public from the books that were purchased. The administrator would have little impact if he/she were involved in the book selection process.

The second possible answer to the question is, "Yes, value was lost" in problem resolution because the administrator was not involved in the decision process. Information available to the administrator could have resulted in a better decision—a decision resulting in higher service. For

example, in planning for a new library annex, if the structural decisions are left to the architecture firm with only minimum input from the library head, value lost could occur. For example, if it became apparent that books to be reshelfed in the annex had to be wheeled outside because escalators, the only access from the main building, made it otherwise impossible to effectively take them into the annex, the service value of the annex has been reduced. There is an actual loss in the service value of the library annex due to lack of administrator input. Again, it is being assumed that with direct top-level administrative input better results are achieved. This analysis is directed at identifying shirking and not incompetence. Furthermore, the assumption that the contribution of a top-level administrator results in better decision analysis does not violate Simon's concept of the administrator as one who does not seek the best solution but only a satisfactory solution.

Value loss analysis is directed at identifying actions not taken by an administrator—those areas without administrator input. It analyzes the operating decisions in an organization to determine if they could have been better made with administrator input. It should be noted that this is only part of the analysis of administrative functions that needs to occur because performance evaluation must also determine where administrator's efforts are made as well as where they are not. The second part of this administrator evaluation question is beyond the scope of this article as the orientation here is in identifying nonaction on the part of the administrator.

A typical cost accounting system ignores the problem of where higher level administrator input is directed. For example, the typical cost system allocates overhead costs such as director's salary to "production" functions—i.e., reference or circulation—within the library to calculate the full cost of operations. It is assumed that the director has a direct impact on all departments. Under the typical cost accounting system, a director's salary would be allocated to all departments in a library on some reasonable basis such as number of employees in each department. Leimkuhler and Cooper (1971) have discussed overhead allocation in libraries. Overhead allocation can be used to determine the full operating costs of these departments. But if it is found that the functions of an administrator do not directly provide a service value to these departments, it seems misleading to assign the director's salary to them. It may be that this administrator's time was divided between getting the budget approved and developing a strategic operating plan for the library. In this case, the director's salary should be assigned to the cost of budget development and the strategic plan for the library. In this method, it is possible to prorate a specific cost to these activities.

Value loss analysis can be viewed in another way. When a library is started, it is very important to have a director who can make decisions involving even minor activities. After the library has been established and is in operation, many of the decisions that would be made by a

director in a new library are then made by department heads. Therefore, the question arises, at what point in the cutback of administrator input does value loss begin to occur? If, after a library is in operation, value loss analysis determines that an administrator is providing service value to only a few unimportant activities, again shirking may have been identified. If it is determined that a library or branch library can be run smoothly without an on-site director, then it may be that shirking is occurring and/or that the organization is top-heavy with administrative positions.

The purpose of value lost determination is to separate those operating decisions for which the director is not providing any direction and no direction is needed from those operating decisions where no administrator direction is provided but is needed. This analysis can be performed as part of the employee interviews that can occur in a performance audit. It is fairly common procedure in performance auditing to interview administrators and others about the functions and activities of the organization. Through the use of a series of questions asked of employees in confidence, conducted by auditors performing a performance audit, it should be possible to determine where administrator input is needed but lacking, and consequently identify this as shirking or as some other problem.

CONCLUSIONS

The methods suggested here can be used in locating some of the potential managerial behavioral problems identified in agency theory. Specifically, these methods are directed at shirking and behavior contrivances that occur because of managerial actions not taken. There are other methods as well that can and are being used. For example, if service measures are available for higher level administrators, they too help to prevent shirking. Reports on assets that have been sold and the use to which these funds have been put on an annual basis provide indications of behavior contrivances that managers may be taking. Changes in the resource base of the organization are a measure of the viability of the organization, and they also may be an indication of behavioral contrivances on the part of a manager. Erosion in the resource base of the organization brings into question the ability of the library to meet its service goals. Of course resource base erosion may be due to the cost of administrative talent. The total cost of managerial talent should be determined. This is not just the cost of salaries and benefits but also the cost of any official or unofficial administrative "perks." Such perks provide additional remuneration to higher level managers, and they should be considered as part of the administrative costs of this management level.

This article has focused on how managerial interpretation of the administrator's role has evolved over time, starting with the writings of Barnard and Simon and ending with agency theory. Managerial

accounting is a means of evaluating administrative performance but, because many methods predate agency theory, the insights of agency theory have never been brought to bear fully on this aspect of managerial accounting (Baiman, 1982) with the result that evaluations of administrative performance are often of limited value if not wrongly premised. This article seeks to bridge the gap between this aspect of managerial accounting and agency theory and in the process to bring the assessment of administrator performance in line with some of the more recent developments of the administrative model.

The suggestions for administrator evaluation made here are ideally suited to the nonprofit environment of libraries where continued financial support may be jeopardized by the perception on the part of contributors and the public that administrators may be receiving more than their fair share of organizational resources.

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Problem Solving Through Experimental Research: The Need for Better Controls

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ABSTRACT

GOOD LIBRARIANS ARE ALWAYS "experimenting"—that is, trying something new (generally to solve some library problem) and watching to see if it works. Unfortunately, since they generally fail to establish appropriate experimental controls, librarians are often left with rather subjective impressions of whether or not their new ideas have worked.

This article discusses the types of controls which need to be established in experimental studies to ensure that the conclusions reached are valid, using actual library experiments to illustrate the points made. Questions that librarians need to ask when they are trying to determine if it is worthwhile investing time and money in experimental research are also suggested.

INTRODUCTION

An experiment is designed to test a hypothesis—i.e., a tentative generalization concerning the relationship between two or more variables in some situation (Mouly, 1978). Examples of simple hypotheses are: variable X causes variable Y to occur and "installing a series of signs within a community college library will decrease the number of directional reference questions asked by patrons." The most popular form of an experiment is the standard pretest-posttest experimental design. For example, in a college library, Joe, who is head of reference services, might count, during a three-month pretest period, the number of directional reference questions asked by patrons. Joe would then install direction signs and count the number of directional reference questions asked during a second three-month period. Finally, he would compare

the number of questions asked before and after the installation of signs to see whether a significant change occurred. If a change had occurred, Joe might be able to conclude that installing the signs influenced the number of questions asked if he has taken precautions to see that the experiment has internal validity.

INTERNAL VALIDITY AND EXPERIMENTAL STUDIES

An internally valid study is one in which the researcher has tried to ensure that it is variable *X*—rather than some other variable—that caused *Y* to occur. The researcher does this by establishing a series of experimental controls to eliminate any compounding variable or form of bias that could influence study results.

The writer's first experiment, conducted with two lab partners for a college science class, was not internally valid. Dale grasped a different object in each hand. Arms extended at a uniform height in front of him, he tried to release the objects at exactly the same instant. My job was to stoop near the floor and record which object, in each of ten pairs of objects, hit first. Cheryl videotaped the process. We spent twenty minutes dropping and recording, dropping and recording, carefully noting minute differences in the "hit" rate, certain that we were disproving the hypothesis that Isaac Newton developed so long ago: the force of gravity causes all objects to accelerate toward earth at the same rate (32 feet per second squared).

We were, of course, wrong. When the instructor slowed down the videotape, advancing it frame by frame, we could see that the small differences in the time it took for each object to hit the floor were caused by a series of human errors. It was impossible for Dale to hold two objects at exactly the same distance from the floor and drop them at precisely the same instant; it was impossible to gauge exactly when each one hit the floor. Because these compounding factors were not controlled for, the conclusions were suspect.

All too often, librarians working in the field test their new ideas without establishing appropriate controls. As a result, their conclusions may be invalid. Last year a medium-sized public library in the United States (name withheld upon request) discovered that it answered 50 percent of its reference questions accurately—i.e., completely and correctly. To remedy this problem, the director organized a series of workshops for the staff on conducting better reference interviews and on developing more systematic search strategies. When the accuracy rate increased to 70 percent, the director concluded that the workshops had caused the improvement.

This experiment has a major problem that is not readily apparent—i.e., the director failed to realize that some factor other than the experimental treatment applied (that is, the workshop sessions) might have caused accuracy to increase. A ten-minute conversation with this library administrator identified four other possible causes of the

improvement: between the pretest and the posttest measurements of accuracy, the worst reference librarian on the staff was fired, the library strengthened its reference collection substantially, and the number of staff working on the reference desk at any one time was significantly increased thus allowing individual librarians to spend a longer time answering individual patron questions. Also, the fourth possible cause for improvement was that questions asked during the two measurement periods were not scrutinized to make certain that they were of equivalent difficulty. It is, therefore, impossible to say conclusively that the reference workshops led to improvement in accuracy.

Even trained investigators find it difficult to conduct, in complex social science settings, experiments that are internally valid because they lack the controlled facilities to study the effects of a change in isolation. That is, they are not working in environments in which rival explanations are easily ruled out. It is not as difficult to conduct internally valid studies in the physical sciences. If the research department of a major fertilizer company wants to determine whether a newly developed fertilizer strain works better than its five major competitors, the scientists involved can begin with six similar sets of corn seed. The scientists can hold all other factors constant in the company's lab—e.g., giving each set of seeds identical amounts of water and light, placing them in soil with identical composition, keeping the growing temperature equivalent, etc. In a controlled experiment of this type, if the seeds treated with the new fertilizer grow an average of 20 percent more than each of the other sets of seeds, there is a reason to believe that the fertilizer caused the greater growth.

Now consider a "simple" library experiment. A school library notices that its 16mm films receive little use. The librarian decides to promote them, going around to individual teachers and hawking the films that relate to each person's teaching area. It is fairly easy for her to measure use before and after the promotion. She may be able to show that use increased and that the increase came after the promotion was made, two necessary conditions for proving causality. But it will be impossible for her to hold constant all other factors that might affect use, especially those that affect individual teachers. For example, a teacher who feels ill may show a film rather than lecture. Use of a particular title might increase because of a renewed interest in that subject area—witness last year's resurgence of interest in John F. Kennedy on the 25th anniversary of his assassination. Teachers could be made aware of films through some means other than the librarian's promotion (e.g., recommendation by a friend). Or interest in films could be renewed due to budget cuts that curtail videotape rental. Determining whether the librarian's promotion has caused the circulation increase is difficult in this complex environment.

Still, trained researchers can identify most, if not all, of the compounding factors that can affect experimental results. They control for

as many factors as they can, then closely monitor the environment to determine if still other factors could be influencing study results.

EXAMPLES OF INTERNALLY VALID STUDIES

Described later are two studies, conducted in public libraries, that established fairly rigorous experimental controls. In the first, Harris and Michell (1986) tried to determine whether library patrons who observed a competent reference interview would be significantly influenced by the "social context" of the interaction. The researchers explored six factors that would possibly affect patron ratings of the librarian's behavior:

1. gender of the librarian;
2. gender of the patron asking the reference question;
3. gender of the person observing the transaction;
4. sex-role identity of the person observing the transaction (the degree to which the observer thinks of himself/herself as primarily masculine, primarily feminine, or as a person who exhibits both masculine and feminine characteristics);
5. warmth of the librarian (the degree to which the librarian smiles, maintains eye contact with the patron, has a friendly tone of voice, and exhibits open body posture); and
6. the level of inclusion exhibited by the librarian (the degree to which the librarian instructs patrons in the use of reference tools).

Rather than having observers watch any reference interview, the researchers developed a series of sixteen videotapes in which four of the experimental factors were purposely and systematically varied—the gender of the librarian, the gender of the patron, the level of warmth displayed by the librarian, and the level of inclusion displayed by the librarian. Other controls used in the study were as follows:

1. To avoid bias due to the question itself, all patrons were asked the same question on a noncontroversial topic (ridding houseplants of insects). In each of the sixteen videotapes, the librarian gave the patron a complete and correct answer to the question.
2. Professional actors, all of whom received instruction from the same professional drama coach, played the parts of the patron and the librarian so that problems with acting ability would not affect final results.
3. To avoid bias from having different words used in each reference interview, only two scripts were used. One illustrated high inclusion on the part of the librarian and one low inclusion. Both scripts involved a multistep reference process.
4. Students enrolled in a graduate library science program prescreened the tapes. Without knowing the purpose of the study, they verified that each tape exhibited the behavior it was meant to illustrate—that is, high or low inclusion, high or low warmth. The students also

verified that the behavior of the male and female librarians on the tapes was similar.

5. A research assistant approached equal numbers of males and females in the lobby of a medium-sized public library and asked them if they would be willing to participate. To avoid bias, observers were randomly assigned to watch one of the sixteen videotapes.
6. Observers were not told the true purpose of the study since that too could have affected study results. Instead, they were asked if they would be willing to participate in a study about "reference work in libraries."
7. The test used to measure the observer's sex-role identity was one developed by a psychologist; it had previously been found to be a valid and reliable way of measuring this quality.

Harris and Michell (1986) found that observers rated "warm" librarians significantly better than "nonwarm" ones. Female observers felt that librarians displaying low inclusion were warmer and more professional while male observers interpreted librarians displaying high inclusion as warm.

The second study utilizing a series of experimental controls was one this writer conducted after reviewing several studies showing that book displays increase the use of the titles they contain (Baker, 1986). The experiment was designed to determine why displays increase use. Two hypotheses were tested. The first was that fiction titles that are displayed in prime locations (where they are highly visible and accessible to browsers) will circulate significantly more than their counterparts on the regular shelves or in a nonprime display location. The second hypothesis sought to test whether displays worked because they narrowed readers' choices by guiding them to a small collection of titles, thus overcoming the effects of information overload. (Information overload is the confusion and indecision which patrons can feel when they are confronted with too many choices from which to make their selections. The potential for overload appears to be very great in all except small libraries.) The study attempted to see whether one narrowing strategy, that of recommendation, would cause fiction titles marked "recommended" to circulate more than their counterparts no matter where they were located—i.e., in a prime display area, a nonprime display area, or on the regular shelves.

The following experimental controls were used:

1. To make sure that factors relating to one library were not influencing any circulation changes, identical studies were conducted in two unrelated libraries located thirty miles apart. The libraries differed in their collection size and also in the service philosophy of staff.
2. To avoid bias in the selection process, books were randomly chosen from the fiction collections in each library and were randomly assigned to six different treatment groups: (a) prime display, recom-

- mendation; (b) prime display, no recommendation; (c) nonprime display, recommendation; (d) nonprime display, no recommendation; (e) regular shelves, recommendation; and (f) regular shelves, no recommendation. Group *e* titles, which were not displayed, served as a control for the display half of the experiment. Group *f* titles, which remained on the regular shelves and received no recommendation, acted as a control for the recommendation half of the experiment.
3. Books in each treatment group were compared and found to be similar to each other and representative of the general fiction collection in terms of other variables thought to affect use—i.e., the book's age, its length, its past circulation history, its physical condition, its format (paperback or hardback), and its cover (with or without jacket).
 4. All books in each treatment group were left in their regular locations for a three-month pretest period, and circulation was measured. The experimental treatment was then applied and circulation was remeasured for a three-month posttest period.
 5. The signs used to promote the prime display books and the carts used to house them were identical to those used for books on the nonprime display. Staff did not promote any study titles during the course of the experiment, and a weekly shelving check ensured that study titles were reshelfed in the appropriate location.
 6. To provide further control, the variables of location and recommendation were reversed during a third, three-month posttest period, and circulation was remeasured. That is, the books that had been displayed prominently during the initial posttest period were moved to the nonprime display and vice versa; books with no recommendation during the initial period were marked "recommended" and vice versa. The reversal of experimental treatments on the same books was done to ensure that any circulation increases were due to the experimental treatments rather than caused by any unique qualities of the books themselves.
 7. Circulation was graphed on a week-by-week basis for the entire nine months to verify that circulation changes corresponded with application of the experimental treatments.
 8. A statistical test controlled for the normal, seasonal variations in circulation that occurred in both libraries. Circulation of a random group of fiction titles during the entire nine months of the study was also observed to verify that no other factor was affecting overall use of the fiction collection.
 9. Patrons who checked out books in the six treatment groups were interviewed to determine why they had selected those particular titles.
 10. Finally, the type of experimental design chosen for the study, the standard pretest-posttest model, controlled for the effects of eight technical factors that could have affected the experiment's internal

validity: history, maturation, testing, instrumentation, statistical regression, experimental mortality, selection bias, and selection-maturation interaction. (A further explanation of these threats to internal validity and controls in experimental design can be found in Campbell and Stanley [1963].)

Study results showed that prime display locations significantly increased the use of the titles involved, but nonprime locations did not. Recommended books were used significantly more than nonrecommended books in the larger of the two test libraries where readers experienced more information overload.

Even though neither of these experiments was conducted in a fixed laboratory environment, the researchers identified and controlled for a number of variables that might have influenced the results. As such, both experiments had internal validity—they were as unbiased as possible, ruling out rival explanations for their findings by controlling the environments in which the studies were conducted as much as possible. In each case, it was reasonable to conclude, in the libraries in which the studies were conducted, that the experimental treatments influenced the behavior of the observers or patrons.

EXTERNAL VALIDITY AND EXPERIMENTAL STUDIES

In laboratory settings, external validity is a secondary goal. That is, scientists attempt to establish controls rigorous enough to enable them to generalize the findings beyond one particular setting. Then they can show that variable *X* will always cause variable *Y* to occur and can state scientific laws, such as the law of gravity, which are always true. Social science researchers, on the other hand, are dealing with a more complex environment—i.e., the field of human behavior. Humans are such complicated beings that literally dozens of variables may influence us to behave in certain ways. As a result, it is difficult, if not impossible, for social science researchers to attain external validity (Guba & Lincoln, 1981; Krathwohl, 1985), or to come up with fixed laws stating principles that should be followed in every situation. Rather, social science researchers end up developing more complicated theories—theories which state that variable *Y* will change (or occur) under certain conditions but not under others. While the absence of fixed laws governing human behavior makes the job of the library researcher more difficult, it also makes it more fascinating.

Like reference librarians, experimental researchers must be puzzle-solvers. They must be able to determine why one treatment caused reaction *A* in one library and reaction *B* in another. Consider the following example. Over the past decade, seven studies examined the use of booklists in libraries. In each case the researcher measured initial circulation of a set of titles then remeasured circulation after promoting titles through a booklist. Circulation of booklist titles remained sub-

stantially the same in three of the studies. Circulation increased significantly in the other four.

Each study was internally valid. That is, within the test library environment the researcher established controls for various factors that might have affected use of the booklist titles in that particular library environment including characteristics relating to the books chosen, the subject of the list, the presence or absence of annotations for each title, and seasonal variations in circulation. But it was not possible for the researchers to control for all variables influencing use.

What factor caused circulation to increase in some cases but not in others? This puzzle can be solved by examining facets of each study to see if one explanation will account for the differences in results. In this case, the factor that appears to have caused booklist titles to circulate in some libraries but not in others is the method of the list's promotion.

Elsewhere, this writer argues that, in order for a particular title to be used, large numbers of patrons have to become aware of that title and have to feel that it will meet some personal need for recreation or enlightenment (Baker, 1986a). Many more people will be exposed to a work than will ever actually want to use it, in the same way that many more shoppers will notice oatmeal on the grocery shelves than will ever actually buy it. And patrons prefer to use works that they find convenient to obtain. If libraries want use of certain titles to increase, librarians should design promotional methods that meet two criteria—that they are easy to use, and that they expose large numbers of patrons to specific titles.

In three of the seven studies, the promotion method did not significantly increase use of booklist titles because it violated these two principles. Taylor (1982), following the test library's usual practice, left booklists out for voluntary patron pickup in a number of unobtrusive spots in the library. As a result, few patrons noticed the lists, picked them up, or used them in their selection. In the other two studies, booklists were not distributed within the library where they would be easy for patrons to use. Rather, they were, in one case, stuffed in student mailboxes at a university (Powell, 1972) and, in the other case, shown on cable television commercials (Auld, 1978). The potential for reaching a fairly large number of patrons with specific reading needs was there, but the convenience factor was missing; persons who wanted the titles were not at the library when they recognized the need. They had to save the lists and then take them to the library at some later date.

Those libraries that increased use of booklist titles did not violate these promotion principles. Lists were promoted within the library in such a way that many patrons saw them. Goldhor (1981) and Golden (1983) gave one to each adult patron, Parrish (1986) displayed the lists prominently at the entrance of the library, and Wood (1985) gave them to patrons who were having difficulty finding fiction titles classified within the Library of Congress scheme.

This example illustrates that researchers have to work harder to come up with theories that will apply to many different situations that exist in complex environments like libraries. Experimental research can, if properly designed by competent researchers, help build these types of theories.

WHEN SHOULD EXPERIMENTAL RESEARCH BE CONDUCTED?

A related issue is how often practicing librarians should test the workability of their new ideas through experimental research (or for that matter, through survey, historical, or other types of research). The answer to this question will differ from library to library and from situation to situation. Generally, a librarian considering the possibility of researching some issue should ask the following questions:

1. Does the change have the potential to greatly improve service or to save a large sum of money for the library over time?
2. Are staff members available and willing to conduct such research? Or, alternately, can the library afford to hire a consultant to design and implement a study?
3. Does the person assigned to conduct the research have the type of specialized training that is needed to design, conduct, and analyze research studies? (This training includes, at a minimum, an in-depth knowledge of the principles of hypothesis testing, causality, study design, and statistics.)
4. Is the library willing to endure the inconvenience of some of the special controls that will need to be established? For example, staff members may be required to keep special statistics, to change their behavior for a short period of time, or to ask patrons to fill out questionnaires to provide supportive evidence for the hypothesis being tested.
5. Is the library willing to bear the expense of the experimental study? While some studies are relatively cheap (costing only a few thousand dollars to design and implement), others may be quite expensive.
6. Is the library willing to use results of the experimental study to make changes? Management must be willing to use experimental results to make the changes indicated. Staff must be willing to drop ideas that do not work, as well as to adopt new strategies shown to be effective.

Only if the answer to each of these questions is a resounding "yes," should a library consider conducting the type of rigorously controlled studies discussed here. Particular attention must be paid to ensuring that appropriate personnel are assigned to or hired for the research project—personnel who are competently trained in the complex and complicated business of research design, implementation, and analysis. Managers are failing their responsibilities if the problems identified are inadequately investigated or if solutions based on inadequate investigations are allowed to be made into practice (Allen, 1986).

The project described later, for example, might benefit from this type of experimental research. Suppose a large public library has established that its community has literacy needs that are not being met by another organization. The library is considering devoting \$100,000 for each of the next ten years to a literacy program that will train tutors to work with adult illiterates and will provide both the materials and the space needed for the tutoring. This extensive monetary investment makes it worthwhile for the library to hire a researcher, preferably before the program is instituted, who can establish, from the beginning, controls that will enable the library to see whether its program will be successful. Over the course of the first year, the researcher might try to determine:

1. which promotional method(s) attracts the most potential tutors;
2. which promotional method(s) successfully attracts illiterate adults to the library's program;
3. which tutoring method (e.g., the Laubach method) has the best results in teaching people how to read; and
4. what practices the library can follow to decrease the dropout rate among both the tutors and illiterate adults.

Over the long run, determining these points should save the library money even if the initial outlay for the researcher's efforts costs \$10,000 or more.

A few libraries, such as the Fairfax County (Virginia) Public Library, have established offices of research, statistics, or evaluation to help them solve important problems of this nature, while others have established "visiting researcher" positions for this purpose. Still other libraries have banded together to solve common problems inexpensively. The Library Research Center at the University of Illinois persuaded libraries to donate \$1,000 each to explore a common problem—finding a quick and accurate way to measure in-house use (Rubin, 1986). Three public libraries in Virginia designed and carried out a joint project to determine: (1) how accurately they answered reference questions, and (2) how they could increase the accuracy rate (Rodger & Goodwin, 1984).

SUMMARY

Using the guidelines given earlier, an individual library can determine whether it is willing to invest the time and money in an experimental study designed to solve a specific library problem. The key to successful experimentation is a highly trained, competent researcher who establishes rigorous controls to attain internal validity. That is, the researcher shows that in this one library, under these specified conditions, a change in variable *Y* resulted from a change in variable *X*, rather than from a change in variable *Q* or *A*. The staff at this library benefits directly from the experiment using study findings to solve the initial problem.

While results of an experiment conducted in a single library cannot be generalized to other libraries, they will, if published for professional scrutiny, benefit other librarians indirectly. When scholars in any discipline accumulate a large body of research on a single topic, they begin to notice consistent patterns. That is, they begin to see that variable *X* will change variable *Y* in certain situations but not in others. This intense scrutiny eventually leads researchers to develop theories, like the one previously described on information overload, that can predict human behavior to some extent. Such theories can guide daily operations in libraries of different sizes and types, benefiting the profession as a whole.

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Questionnaire Ambiguity: A Rasch Scaling Model Analysis

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ABSTRACT

ONE OF THE MOST IMPORTANT means of gathering information about libraries has been by the use of questionnaires. Yet many studies show the questionnaire methodology to be an imperfect means of generating reliable information. This paper reviews the types of problems that have been associated with questionnaire based surveys and focusses upon one, the ambiguity of questions. A mathematical model is proposed to explain a type of ambiguity that often occurs in questionnaires and data presented that is consistent with model predictions.

INTRODUCTION

It is fitting that in a tribute to Herbert Goldhor so many articles have an emphasis on research methodology. How one properly carries out research has been a lifelong concern of Goldhor as a scholar, as a teacher, and as director of the University of Illinois' Library Research Center. It is significant that he is the author of an early and still respected book on research methods written for a library audience (Goldhor, 1972).

This interest of Goldhor is reflected in the theme of this collection, problem solving, for problem solving begins with a search for reliable, pertinent information, and research methodology deals with how one gathers information in which one can have confidence. That issues such as bias, validity and reliability, proper sampling technique, and instrument construction are still matters that can generate controversy is demonstrated by the recent exchange in *Library Quarterly* (Bookstein & Biggs, 1987; White, 1987).

The position taken in this article is that the types of problems with which researchers in the information sciences deal are complex and that

a casual approach to how we obtain the data on which we base our conclusions can result in very serious errors. The tools that we use to get information are deceiving in their simplicity. Selection of objects to examine and formulation of questions all seem natural human activities. Yet when we seek detailed and subtle information, how these tasks are implemented can strongly influence the results we ultimately obtain and our responses to the problems that motivated our investigation. In such a situation it becomes important that the tools by which we gather information become objects of inquiry, and that we undertake the effort to learn how these behave in the contexts in which we use them.

In this article we will report on the results of one such effort in the area of questionnaire design, one of the most heavily used techniques for getting data about libraries. The popularity of questionnaire research is easy to understand—it is both direct and conceptually simple. To conduct a questionnaire survey, we formulate what interests us about an area as a sequence of questions to be presented to the relevant population, and then analyze the responses of those who cooperate, much as we gather information in everyday life. Further, the manner in which the final data are often accumulated makes it very difficult to detect error even when it is present. The scholarly apparatus of coding, tabulation, and statistical testing provides a sense of propriety and security in the results. But these analytical techniques are adjuncts to proper methods for collecting data, not substitutes for them. Even the most sophisticated of statistical packages will digest misleading sets of data as comfortably as they will valid data (perhaps even more so, since poor data collection methods will often impose a degree of regularity on the data not present in the material being studied) (Campbell, 1959).

Responding to a question involves at least four stages of activity:

1. a question is presented to and interpreted by a respondent;
2. the respondent must rely on memory and a variety of cognitive processes to construct his own understanding of what information is needed to answer the question;
3. the respondent must decide whether to answer honestly or at all and what aspects of the information elicited to share with the researcher; and
4. the response must be transformed into words or categories understandable by the researcher.

Each of these activities is complex and subject to error.

An awareness that people often do not provide good answers to questionnaires, and that the process of answering questionnaire surveys was deserving of systematic investigation, existed at least by the mid 1950s (Hyman, 1956). Many sources of error in questionnaire response have subsequently been identified and investigated. For example, Bradburn and his associates (1979) have carefully examined the degree to which people respond honestly to questions about socially unacceptable

able behavior; they and others (e.g., Kolata, 1987) consider a range of approaches for compensating for the tendency to distort reality in such situations.

Errors are sometimes introduced in questionnaire responses because of the cognitive processes involved in storing and retrieving information from memory, even when the respondent intends to cooperate fully with the research. The format of a question, for example, whether it is open- or closed-ended, has been found to affect responses (Schuman & Scott, 1987) partially because the framework it establishes for the response categories influences what information is retrieved from a respondent's memory. The ability to retrieve information from memory and mechanisms that might distort the results of such a retrieval have often been studied. For example, very pronounced and systematic effects are present when time related information is requested (Neter & Waksberg, 1964; Sudman & Bradburn, 1973; Bradburn, et al., 1987). But concern about how people respond to questions demanding quantitative information, and in particular, how they use words denoting quantities, has been evident for some time (Simpson, 1944; Hoyt, 1972; Pepper, 1974), including one study taking place within a library context (Kidston, 1985).

Of particular interest to us are problems of ambiguity in questions about library activity. Although it has long been recognized that people understand the same words in different ways, and that this affects their responses to questionnaires (Payne, 1951), it is only relatively recently that the implications of this for research in libraries have been probed. In this article we will examine one study (Bookstein, 1985; Kidston, 1985) that did find differences in how people understand words that occur frequently in library surveys.

The term *ambiguity* refers to the problem that different people understand the same term or expression in different ways. But though the single term, *ambiguity*, is used, there are many reasons why the phenomenon it refers to might happen. We believe that ambiguity is a serious and easily overlooked problem in questionnaire design, and that understanding more precisely why it is that two people might disagree on the meaning of a commonly used term is an important first step in learning how to control this problem. In the papers by Bookstein (1985) and Kidston (1985) noted earlier, a specific and very interesting mechanism for such disagreement suggests itself that might apply to a variety of terms occurring in library questionnaires. Specifically, we argue that a source of ambiguity of some terms—for example, the word *use*—is a scaling phenomenon. Different activities that take place in libraries are associated with libraries to different degrees, while at the same time individuals differ in their willingness to accept a degree of “librariness” as constituting a library activity. When such words occur in the questions people are asked about libraries, how people respond can be influenced by their location on this scale. If this phenomena is in affect,

the disagreements it produces should exhibit a great deal of regularity; studying data designed to bring out these regularities should both reveal the existence of such a scale and allow us to place both library activities and respondents on the scale. In this article we will explore the ability of a scaling technique, the Rasch Scaling Model, to fit and explain data we have collected to display disagreement on whether specific activities constitute library uses.

In the following sections we will describe the experiment that was carried out to explore the problem of question ambiguity and apply the Rasch Model to the resulting data. However, as not all readers are familiar with scaling methodology, we will first offer a quick overview of what scaling is and, specifically, describe the Rasch approach to scaling.

BACKGROUND

The measurement of attitudes and perceptions is common in social science fields like education, psychology, and sociology. The measurement procedure often involves a series of items on a questionnaire. When successful, the process results in a well defined variable, on which both the items used to make the measurement and the subjects being measured are assigned values, depending on the extent to which they exhibit the quality in question. This is essentially a scaling process.

In this study, we apply a method of scaling to the field of library and information science. The attitude under investigation is a somewhat abstract concept that we refer to as "library sensitivity." By this we mean the propensity to identify activities occurring in libraries as inherently library activities.

People vary in their use of libraries and their attitudes about libraries. Attempts have been made to explain such variability in terms of demographic and social variables. Such efforts always leave a substantial amount of variance unexplained. We are suggesting the existence of library sensitivity as an intrinsic personality variable that may contribute to explaining user behavior; we also describe a means for measuring this quantity by using the Rasch Psychometric Scaling Model to develop a scale of library sensitivity. If this personality trait is in fact a definable and scalable phenomenon, the establishment of a formal measurement tool would provide a means of measuring this trait, which in turn would permit us to observe correlations between this characteristic and other personal qualities.

The possibility that library sensitivity might exist as a personality characteristic was suggested by the results of previous research carried out by Bookstein (1985) and Kidston (1985) on questionnaire design in a library context. In these studies, several problems in questionnaire research were examined. Particularly interesting was the problem of question interpretation—that is, whether different people share a common understanding of the phrases used in questionnaires to describe

basic library activity. The concept of *library use* was found to be ambiguous. On the basis of these studies, it is reasonable to expect that when subjects are asked how often they *used* the library or a library's material (as opposed to a more specific question such as, How many times did you check out a book?), the resulting data are probably inaccurate. This is because, as these studies show, interpretations of the term *use* vary widely—two people, having performed the same library activities, may very well respond differently to the library use question although both are trying to respond honestly.

In the above research, respondents were presented with descriptions of a number of activities occurring in libraries, and, for each, asked whether, if they had engaged in that activity, they would describe themselves as having used the library. Table 1 (Bookstein, 1985) shows the responses of two groups of people to questions about their interpretations of library use. The GLS group was comprised of University of Chicago Graduate Library School students and their friends while the GSB group was made up of University of Chicago Graduate School of Business students. The results show that even within fairly homogeneous groups of people, there is much variability in the perception of library use. For example, each group was split approximately evenly on accepting the action of unsuccessfully trying to find a book in the collection as a library use. Even actions which most people agreed to view as library uses (e.g., recalling a book) still showed some disagreement.

Our interest here in these results is not in the surprising variability of interpretation but rather in the regularity that appears within the variability. As seen in Table 1, both groups' overall ranking of the questionnaire items is approximately the same—recalling a book, for example, is the item most frequently seen as a library use by either group. The most striking disagreement in ranking is that the GSB group much more often saw "reading own book" as a library use. This is "probably because, for most, this is all they did in the library" (Bookstein, 1985, p. 26). On the other hand, although items were ordered similarly in both groups, the GSB group seemed nearly consistently less likely to describe an activity as a library use. It is the systematic and probabilistic character of this response pattern that we are trying to explain in terms of a Rasch-Model scale.

According to Wright and Masters (1982): "The invention of a variable begins when we notice a pattern of related experiences and have an *idea* about these experiences which helps us to remember their pattern. If the idea orients us to more successful action, we take it as an 'explanation' of the pattern and call it a theory" (p. 1). The pattern displayed by the GLS and GSB groups suggests the existence of a variable representing the willingness of individuals to see actions as library uses or, more generally, representing library sensitivity. Bookstein (1985) suggested a preliminary scaling model to represent this idea:

people engage in a wide range of activities in a library. These activities fall along a scale of "librariness"—the extent to which people tend to associate that activity with libraries. On the other hand, people also fall along a scale according to their willingness to see an activity as a library use. The response to

TABLE 1
POPULATION AGREEING ON WHAT CONSTITUTES LIBRARY USE

<i>Action</i>	<i>Percent Considering Action as a Use of Library</i>	
	<i>Bookstein (GLS) (n=43)</i>	<i>Kidston (GSB) (n=90)</i>
Recalled a book	88%	74%
Duplicated an article	81%	65%
Checked name in card catalog	70%	53%
Read own book	58%	89%
Tried unsuccessfully to find book	51%	42%
Returned a book	38%	18%
Met a friend	19%	24%
Used restroom	19%	3%

a particular question, then, is governed by both the position of the activity and the individual on this scale. (p. 26)

In our study, we build on this preliminary model by applying the Rasch Model to the instrument described earlier. This psychometric scaling model enables us to determine formally whether the phenomenon observed is indeed a measurable attitude variable.

SCALING METHODS

Background

Scales are created to compare characteristics of objects along a common unit of measure. While scaling methods share this objective, their procedures vary greatly. (The characteristic being measured in our study is an attitude or personality trait; however, the same scaling methods can be used for other variables such as amount of knowledge on a specific topic or personality traits such as introversion.)

The simplest and most direct scaling method consists of a subject marking his own location on a graphical representation of the scale. This method requires a detailed description of the concept being measured in order to indicate clearly what values of the concept each location on the scale represents. The method also depends on an honest and objective self-evaluation on the part of the subject. More often, scaling methods act indirectly, combining a subject's responses to several items into one score that is then used to locate the subject's position on a scale. Instead of directly asking a subject to identify his location on the scale, they solicit related information that allows a scaling procedure to calculate the location. Item inventories are a popular means of obtaining the multiple responses needed for this method. In this section, we will review scaling techniques used in conjunction with questionnaire-like item inventories.

In developing a scaling questionnaire, one assumes that the con-

cept being measured can be defined by a set of items that follow a single line of inquiry (Wright & Masters, 1982). This simply means that a number of statements can be made relating to the concept in question, that these statements can be placed on a scale according to the amount of this concept that they represent, and that most people would agree with this placement. This quality is known as unidimensionality. For some cases, the unidimensionality of an attitude variable has already been established. In other cases, it has not been proven but may seem likely. In the latter case, the scaling operation takes on the additional task of testing the hypothesis that individual items being combined to form a single scale score also can meaningfully be organized along a single dimension (Kidder, 1981). If this hypothesis proves false, a meaningful univariate scale cannot be devised.

Some concepts are broad enough to have many aspects (or dimensions) along which scales might be formed. "When the notion of measurement is applied to so complex a phenomenon as opinions and attitudes, we must here ... restrict ourselves to some specified or implied continuum along which the measurement is to take place" (Thurstone, 1928). Using a restricted set of items to measure a complex concept is an accepted part of the scaling process. In general, effort is made to measure only a single interesting aspect of the concept. Thurstone (1928) notes that when measuring a table, for example, usually only one attribute (e.g., height, cost, or beauty) is being measured. This attribute is used to represent the more general concept, which is the entire table, in a particular domain of investigation.

In addition to unidimensionality, scaling models have other requirements and characteristics. They must be able to describe small as well as extreme degrees of difference between objects. Therefore, the items on the questionnaire must be varied enough to represent a wide range of values of the concept.

Rasch scaling procedures begin with raw scores. "All information about a person's ability expressed in his responses to a set of items is contained in the simple unweighted count of the number of items which he answered correctly. [For the Rasch Model] raw score is a sufficient statistic for ability. For item difficulty, the sufficient statistic is the number of persons who responded correctly to that item" (Wright & Mead, 1977). While raw person and item scores provide the information necessary for scaling, they cannot directly form the scale because of several inherent problems.

Essential to scaling is the notion of a common unit of measure. We are familiar with standard measurement units such as the inch and centimeter. With regard to tests and questionnaires, appropriate units of measurement are less obvious. Students are sometimes ranked by raw test scores, where, for example, a score of twenty correct out of twenty is perfect and ten correct out of twenty is failing. One might be inclined to assume that a student achieving a score of ten possesses half as much of

the characteristic probed by the test as a student scoring twenty. However, comparison of the students' abilities cannot be made on the basis of raw scores in the same way that two height measurements could be compared. Raw scores depend strongly on the particular test or questionnaire items in use; therefore, they describe the ordering of subjects but not the distance between them. Thus, in the earlier example, the amount of the variable required to correctly answer the second ten test items may be much more or only slightly more than that which the failing student possesses. Item and subject scores must be properly placed on a common scale with respect to the amount of the variable they exhibit in order to measure distances between scores. Scaling methods, in varying ways, transform raw item and person scores into these single-scale values.

Scaling models should also attempt to free the scale from any dependence on a particular set of items or subjects. Raw scores are, of course, completely dependent on the particular questionnaire items and subjects involved. A questionnaire with most items representing small amounts of the variable would tend to produce higher raw scores than would a questionnaire in which most items represented more of the variable if both were given to subjects with the same distribution of attitudes. Our goal is to obtain equal scale values for those subjects that exhibit equal amounts of the variable being measured no matter what set of items is used on the questionnaire. Therefore, scaling methods must take into account the demands of the items and accordingly translate the raw person scores to scale values. An analogous operation must take place with the item scores and item scale values. Raw item scores depend on the attitude levels of the test subjects. This dependency must be removed if the items are to be located on a scale according to the absolute amount of the variable they exhibit.

Finally, scaling methods should provide some means of testing the fit of the data to the scaling model. One can always devise rules to place raw scores on a linear scale; however, one must be sure that the resulting item and person scale values make sense. This may be done by studying the actual detailed responses of individuals, considering the scale values they are assigned, and deciding whether this is logically acceptable. Tests of fit may also be done using more advanced statistical methods.

Some Examples

During this century many scaling models have been developed. We will review some of these briefly. Pioneering work was done by L. L. Thurstone in the 1920s and 1930s. Thurstone is most closely associated with *differential scales* (Kidder, 1981, p. 301). These are attitude scales whose items are statements that represent the entire range of possible opinions (i.e., items are included that oppose, support, and are neutral toward the concept). The items are ranked by human judges, and subjects are located on the scale according to the items with which they

agree. If the model fits, subjects should agree only with a subset of the items located adjacent to each other on the scale and should not agree with items to the left and right of these. Scale scores can be computed for those who agree with items spread out along the scale, but the meaningfulness of such scores is questionable. Thurstone applied the scale model characteristics discussed earlier with varying degrees of success. He was aware of the need to free the scale from dependence on a particular subject group or set of questionnaire items. His adjustments for these sample effects were based on group level descriptions of the ability distributions, such as the mean and standard deviation, and on the assumption that the ability distributions were normal (Engelhard, 1984).

Cumulative scales differ from differential scales in the way that individuals respond to their items. Here the items are statements that either support or oppose (in varying degrees) the concept. "The items are related to one another in such a way that, ideally, an individual who replies favorably to item two also replies favorably to item one; one who replies favorably to item three also replies favorably to items one and two; and so on" (Kidder, 1981, pp. 217-18). (The numbers one, two, and three above indicate the items' ranked position on the scale, not their position in the questionnaire.)

Louis Guttman (1944), created the notion of a cumulative scale with his scalogram method. This method graphically and statistically tested for cumulative scale-type patterns of responses. Guttman (1950) saw this method essentially as a test of unidimensionality and described it as follows:

The basic condition to be satisfied is that persons who answer a question "favorably" all have higher scale scores than persons who answer the question "unfavorably". This constitutes a rigorous definition of a scale. It provides a simple, objective technique for testing the existence of a single variable, that is, for determining whether the questions have the same meaning for all respondents. (pp. 76-77)

Guttman's model is based on the principle that a subject will respond consistently (either favorably or unfavorably) to each item on the scale up to the level of his ability/attitude. Beyond this point, he will continue to respond consistently but in the opposite manner. Once a person's scale score is known, his response to any particular item is predicted by the model to be either definitely favorable or unfavorable (depending on where the item is located on the scale, relative to the subject's location). Guttman realized that perfect scales do not exist and allowed for some deviation from the model's required response pattern. His "coefficient of reproducibility" is a statistic indicating whether the data's deviation from the model is significant or not.

Specific examples of these types of scales can be found in standard textbooks on research methods, such as Selltitz, Wrightsman, and Cook's *Research Methods in Social Relations* (Kidder, 1981).

Rasch Model

Overview. The scaling model which we employ for this study was developed in the 1950s by the Danish mathematician Georg Rasch while developing educational accomplishment scales. This model incorporated much of Guttman's idea of a cumulative scale but improves on it by the addition of a probabilistic response function. Rasch argued that the deterministic models of classical physics did not suit descriptions of human behavior. Here, he believed, it is better to apply the nondeterministic models of modern physics—i.e., “(to employ probability) where chance plays a decisive role: The possible behaviour of a pupil is described by means of a probability that he solved the task” (Rasch, 1980, p. 11). By defining a probabilistic model that relates performance to person and item parameters, Rasch's model makes it possible both to estimate person and item scores and also assess whether the model fits, or reasonably describes, the data.

The Rasch Scaling Model stems from the idea that a person's response to an item in an ability test is governed by two factors: the difficulty of the item and the ability of the person. (In the case of attitude measurement, item “difficulty” corresponds to the difficulty in agreeing with the item; person “ability” corresponds to the amount of the attitude exhibited by a person or the ease with which a person agrees to items expressing the attitude.) Given item difficulties and subject abilities, the model describes the probability of a certain response (contrasting with other models that describe with certainty what that response will be).

The governing factors—person ability and item difficulty—constitute the two parameters of Rasch's model. A distinguishing feature of the model is that these parameters are separable, making it possible to derive estimators of each parameter independently of the other. Thus, the separability makes possible objective measurement in the sense that measurement is not dependent on a particular set of items or persons. Rasch (1980) refers to this quality as “specific objectivity” (p. 11). Previous researchers (e.g., Thurstone) recognized the necessity of such objectivity and attempted to achieve it by procedures accompanying their models. The Rasch Model stands out in that this objectivity is achieved by the model itself. Rasch's model takes the form:

$$P \{success \mid \beta_v; \delta_i\} = e^{(\beta_v - \delta_i)} / [1 + e^{(\beta_v - \delta_i)}]$$

which determines the probability of a successful response by person v to item i , where β_v is the ability measurement of person v and δ_i is the difficulty measure of item i .

Scale Characteristics

The scale defined by this model is measured in terms of units called

logits. The measurements β and δ are logit values. A person's ability β represents the natural log of the odds in favor of his succeeding on an item whose difficulty is at the origin of the scale (i.e., whose δ value equals zero). "A person with ability 0.0 (i.e., ability equal to the difficulty of an item at the origin) has an even chance (odds 1 to 1) of succeeding on the item since $\log(1) = 0 \dots$ " (Wright & Mead, 1977, p. 20). Similarly, the item difficulty δ represents the natural log of the odds in favor of a person with ability β equal to zero failing on an item. When person ability β is equal to item difficulty δ , the person has a .5 probability of agreeing with that item.

These results are as expected—e.g., one would expect a person to be likely to agree with an item that he surpasses in librarieness (i.e., an item that is easy for him). Conversely, one would expect a person to be likely not to agree with an item that exceeds him in librarieness. When the person and item coincide, the person is as likely to respond one way as the other.

As mentioned previously, raw scores are sufficient statistics for creating scales. The task of Rasch analysis is to transform the raw scores into a unidimensional interval scale. Item scores are converted to logit difficulty estimates in a process called item calibration. Similarly, person scores can be converted to logit ability estimates. Various estimation techniques can be used (see Wright and Mead [1977] and Wright and Douglas [1977] for examples). In our study we used the unconditional maximum likelihood procedure as developed by Wright and Panchapakesan (1969)—maximum likelihood estimates a probability distribution's parameters by setting them equal to values that make them as consistent as possible with the observed data. For our problem, it is an iterative procedure that takes raw item and person scores and converges them to the best fitting β and δ values. The estimation procedure requires the elimination of zero and perfect item and person scores. The model cannot scale such scores. Consider, for example, a person with a perfect total score. We cannot ascertain if this person's ability should be placed slightly higher than all other ability estimates or much higher. We cannot determine this unless we add an item whose difficulty is greater than the person's ability (i.e., an item that the person cannot agree with or cannot answer correctly).

Tests of Fit. Scale values have now been established for persons and items. Before continuing, however, we would like to confirm that the items do represent values along a single scale and that the subjects responded consistently to this same single variable—that is, we must ascertain that the model fits the data.

We check item and person fit separately. In testing item fit, we look at the individual responses to each item. Based on the model, we expect persons with sensitivity values less than the difficulty value of the item not to agree with the item and those with greater sensitivity values to

agree with the item. As the model describes, there is, of course, some chance that the responses will not occur this way. We take this into account and allow for some variability in expected responses. An item may be judged as not fitting when it receives a significant number of unexpected responses. An item that does not fit is most likely drawing on knowledge and/or attitudes that do not correspond to the concept being measured. For example, Wright and Masters (1981), in a test of drug knowledge, found that a question about drug legality did not fit with other questions that focused more on the use and effects of drugs. The legal question was estimated to be fairly difficult. However, those who had a good knowledge of the more scientific aspects of drugs (and hence received high ability ratings) turned out to be the ones who most often missed this question. Those with less estimated drug knowledge answered this question correctly with an unexpectedly high frequency. Whatever the legal question is measuring, it is not the same knowledge concept required by other items. Such nonfitting items should be removed and the remaining items should be recalibrated.

Similar lack of fit can occur with persons as well. This can be caused by such things as cultural or educational differences. If, for example, a person obtains a low scale rating but agrees with (or answers correctly) only the least likely to be agreed with items, that person is not responding along the same dimension as described by the scale. In such cases, the scale score should not be used as it is an inaccurate and possibly an unfair measurement.

Misfitting items and persons sometimes stand out due to very unexpected responses. However, we generally need a statistical test to determine whether the response variation is significant. The Rasch Model makes this type of test easy. The model describes the probability of each response for every person-item interaction (by substituting fitted β and δ values in equation 1 noted earlier). We can subtract this expected value from the observed value to obtain a score residual. These residuals can be summed over all item responses for a particular person or over all person responses to a particular item. From these sums a t statistic—a standardized residual—can be calculated (Wright & Masters, 1982, p. 101). When this statistic is significant at the .05 level, the person or item should be removed. Other fit tests are described in Wright and Panchapakesan (1969) and in Wright and Mead (1977).

Rasch Model Applications. Rasch scaling is a very general technique and many examples of its application are available. Among them are pistol marksmanship of Military Police (MP) candidates (Wright & Mead, 1977), knowledge about drugs, attitude toward drugs, fear of crime, and knowledge of physics (Wright & Masters, 1982). Some examples of how such a model might illuminate problems in library and information science follow.

1. *Indexing Example.* Consider the task of assigning index terms to documents. Viewed abstractly, this process has much in common with taking a test or completing an attitude-measuring questionnaire. Here, each index term is associated with a scale; with respect to a particular term, a document will be about that term to some estimable degree (from not at all to very much), in the same way that a person might possess a particular ability or attitude in some measurable amount. At the same time, each indexer has a different threshold for assigning a particular index term in the same way that each item on a test or questionnaire has a threshold ability or attitude requirement in order for it to be answered correctly or agreed with. According to this model, the difference between an indexer's location on the scale and a document's position determines the probability that the indexer will assign that term to the document. Therefore, just as test items and people can be measured and located along a common scale with regard to an ability or attitude, indexers and documents can be scaled with regard to a particular indexing term or concept, and the likelihood of an indexer's assigning a term to a document can be modeled by equation 1. Indexing is a complex and poorly understood process. There has been much controversy regarding the degree to which indexers are inconsistent. The possibility of an underlying scaling phenomenon sheds light on one aspect of this problem. This model should be tested; if valid, scaling documents and indexers in this way would be helpful in understanding the problem of interindexer inconsistency in that it would show the differences between indexers in a concrete way. Dealing with those differences in order to improve indexing consistency could then be better addressed.
2. *Collection Development.* The model has been used to illuminate aspects of library collection development (Bookstein, 1988). Libraries differ in the strengths of their collections, and books differ in their desirability to libraries because of the subjects they represent and the strength of those subjects in the libraries' collections. Whether or not a library gets a book can be stochastically associated with these factors. In terms of the Rasch Model, a book is like a test or questionnaire item in that it represents a particular amount of a subject. Its difficulty level might be described as the amount of difficulty an acquisitions librarian would have in selecting the book, taking into consideration the library's strength in the subject area represented by the book. Libraries are like people being tested in that they have varying strengths in a subject area just as people have varying abilities or attitudes regarding a particular test variable.

If this model is valid, library collections and individual books can then be scaled with regard to a particular subject area such as calculus or botany. Those libraries ranking high on the scale would be those with the strongest collections in this subject and, hence,

those with the greatest ease in selecting a book on the topic. Books ranking high would be those with a high difficulty of being selected. Only libraries with the strongest collection rankings would purchase such books.

A useful concept that follows this model is that of a "Peer Group" of libraries; with respect to a class of books, a peer group of libraries is a group in which the likelihood that a library will acquire a book is determined by the strength parameters of the book and the library alone. Since any other considerations separate a library from the group, another less formal way of expressing this idea is that a peer group of libraries (with respect to a class of books) is a group differing in collection strength but sharing a collection personality. The model proposed here serves as a formal definition of a peer group; it shows us how to evaluate the pertinent parameters, and it provides a mechanism for alerting us to instances when a library has not acquired a book that seems appropriate for it to acquire given its membership in a peer group. A third example, which constitutes the body of this article, is based on an application of the Rasch analysis to questionnaires.

APPLYING THE RASCH MODEL TO QUESTION AMBIGUITY

In our study, we use a questionnaire of twenty-two items to define the library sensitivity scale (for the entire questionnaire, refer to Bookstein, 1980). The dimension we develop deals with the concept of use as it applies to libraries and to research tools such as journals. We ask subjects to indicate whether they consider certain activities to be uses of research material or of the library itself. Our questionnaire is based on those used by Bookstein (1985) and Kidston (1985), with minor changes. We chose this approach to the concept of library sensitivity since the previous research has already shown the scaling tendencies.

Our questionnaire consists of four sections, each with several items. Section 1 describes various interactions one might have with a journal in a library, and asks if one considers that interaction to be a use of the library. For example, item 3—"Would you say you 'used' the library today if you obtained an issue of a journal or magazine in that library and looked at the advertisements while waiting for a friend." Section 2 asks whether journals are considered to be "used" or "read" under certain conditions; for example, item 4—"Would you describe a journal as being among those you 'read' (on a continuing basis) if you subscribe to it as one of several journals in a field close to your main area of interest? However, you only have time to scan carefully three or four of the twelve issues published each year." Section 3 focuses on use as it relates to books and libraries. For example, item 8—"While looking for a book in the stacks you notice a book you weren't aware of with a title suggesting it is on the same topic. You glance through it. Would you say you 'used' the book if, after seeing the publisher and copyright date, you

return it to the shelf?" Section 4 describes a variety of activities carried out in a library (many of which can also be done elsewhere) and asks whether each constitutes a use of the library; an example is item 13—"If you were asked how often you 'used' the library, would you count the time when you checked the spelling of an author's name by referring to the card catalog?" Each item requested a yes or no answer from the subject.

The motivation behind this investigation was to understand better what people mean when they respond in a library use survey that they used a library. The variation in response that we found suggests that it is quite possible for several people to engage in the same or similar activities, yet some would, on the basis of those activities, say yes, they did use the library, while others would say no, they did not. Thus, when we learn from a survey that a certain percent of the population used the library last month, we should recognize that this figure reflects differences in interpretation of the word *use* as well as differences in the behavior of interest.

The questionnaire was given to forty-two individuals—thirty-three students in a research methods class at the Graduate Library School of the University of Chicago, four librarians at a Chicago special library, and five nonlibrarians. Random selection of subjects was not necessary since item calibration can be done with any set of subjects as long as the model fits for most of the subjects.

The responses were analyzed with the MSCALE computer program developed in the Department of Education at the University of Chicago (Wright et al., 1987). This program estimates person abilities, item difficulties, and tests the fit of the model. It can be used with multiresponse category items or with dichotomous data.

RESULTS

Our data matrix (see Table 2) shows the responses of each tested subject to each item. The number of items listed has been reduced from the original twenty-two to seventeen as five items had perfect scores (all subjects responded "yes" to these) and were therefore removed. One subject responded "yes" to every item and was removed leaving the final count of scalable subjects at forty-one. The subjects are ordered from those most likely to interpret an activity as a library use at the top, to those least likely at the bottom of the chart. Similarly, items are ordered from those easy to interpret as a library use (on the left) to those most difficult. This arrangement emphasizes any inconsistency in the pattern of responses.

Item Analysis

A chart of item calibrations as calculated by the MSCALE program is shown in Table 3. The score column indicates the number of subjects agreeing with the item out of a total sample size of forty-one. The

TABLE 2

PATTERN OF RESPONSE OF PERSONS (ROWS) TO ITEMS (COLUMNS). A ONE INDICATES THE PERSON AGREES WITH ITEM; A ZERO INDICATES DISAGREEMENT. BOTH ROWS AND COLUMNS HAVE BEEN ORDERED ACCORDING TO SCALE VALUES

		ITEM NUMBER (easy items — — — — — → difficult items)																	TOTAL
		11	9	16	12	18	4	10	6	5	7	15	22	3	14	20	17	8	TOTAL
PERSON NUMBER	11	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	15
	6	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	0	14
	39	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	14
	30	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	13
(high scores	34	0	1	1	1	1	1	0	1	1	1	1	1	0	1	1	0	1	13
	8	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	13
	2	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	13
	25	1	1	1	1	1	0	0	0	0	1	1	1	1	0	1	0	1	12
↓ ↓ ↓ low scores)	36	1	1	1	1	0	1	1	1	1	1	0	1	1	0	0	0	1	12
	37	1	1	1	1	0	1	1	1	1	0	1	1	1	1	0	0	0	12
	24	1	1	1	1	1	0	1	1	1	1	0	1	1	1	0	0	0	12
	38	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	12
	12	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	12
	21	1	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	0	11
	19	1	1	1	1	1	0	1	0	1	1	0	1	0	1	1	0	0	11
	35	1	1	1	1	0	1	1	1	1	1	1	1	0	0	0	0	0	11
	17	1	1	1	1	1	1	1	1	0	1	1	1	0	0	0	0	0	11
	23	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	11
	33	1	1	1	1	1	1	1	0	1	1	0	0	1	0	0	0	0	10
	32	1	0	1	0	1	1	1	1	1	1	1	1	0	0	0	0	0	10
	28	1	1	1	1	1	1	1	0	1	0	0	1	0	0	0	1	0	10
	16	1	1	1	1	1	1	0	1	1	1	0	0	1	0	0	0	0	10
	3	1	1	1	1	1	1	1	1	0	1	0	1	0	0	0	0	0	10
	27	1	1	1	1	1	1	1	0	1	1	1	0	0	0	0	0	0	10
	10	1	1	1	1	0	1	0	1	1	0	0	1	1	0	0	0	0	9
	1	1	1	1	1	0	1	1	1	1	0	1	0	0	0	0	0	0	9
	14	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	9
	9	1	1	1	1	0	0	1	0	1	1	1	1	0	0	0	0	0	9
4	1	1	1	1	0	0	1	1	0	1	0	0	0	0	1	0	0	8	
13	1	1	1	0	1	0	1	0	1	1	1	0	0	0	0	0	0	8	
20	1	1	1	1	1	1	0	0	0	1	0	1	0	0	0	0	0	8	
31	1	0	0	0	1	1	1	1	1	1	0	0	0	1	0	0	0	8	
29	1	1	1	1	1	1	0	1	0	0	0	1	0	0	0	0	0	8	
7	1	1	1	1	1	0	1	0	1	1	0	0	0	0	0	0	0	8	
5	1	1	1	1	1	0		0	1		1	0	0	0	0	0	0	7	
18	1	1	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	7	
26	1	1	1	0	1	1	0	1	0	0	1	0	0	0	0	0	0	7	
15	1	1	0	0	1	1	0	1	0	1	0	1	0	1	0	0	0	7	
40	1	1	1	1	0	0	1	0	0	0	1	0	0	1	0	0	0	7	
22	1	1	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	6	
41	1	0	0	1	0	0		1		0	0	0	0	0	0	0	0	3	
TOTAL		40	38	36	34	32	31	30	30	30	29	23	22	14	9	4	4	4	

(Blanks indicate missing responses)

measure column is the item difficulty figure (in logit units), with high values indicating items more difficult to interpret as a library use. Error is the standard error of the measurement. The fit statistic is calculated from the item residuals. The expected value of this statistic is zero with values of absolute size greater than two indicating lack of fit.

Some of the most difficult items are those that ask about library use in connection with activities that might occur in a different setting. (Examples are items referring to using the restroom, meeting a friend, and looking at journal advertisements.) Attending a lecture in the library, while not a library specific activity, was much more frequently considered as a library use. Perhaps this is because it has a more intellec-

TABLE 3

ITEMS APPEARING IN TEST, WITH RAW SCORE, RASCH SCALE VALUE, ESTIMATED STANDARD ERROR AND FIT MEASURE. MOST ITEMS HAD ONE OF THREE STANDARD INITIAL SEGMENTS FOLLOWED BY A SPECIFIC ACTION. THESE INITIAL SEGMENTS ARE ABBREVIATED BY A, B, AND C

ITEM STATISTICS					
NUM	QUESTION CONTENT	SCORE	MEASURE	ERROR	FIT
8	B + Would you say you "used" book if, after seeing publisher and copyright date, you return it to shelf.	4	3.14	.57	.27
17	C + Went only to use restroom.	4	3.14	.60	-.10
20	C + Use library as place to meet friend.	4	3.14	.64	-.72
14	C + Went in to return a book.	9	2.06	.46	.93
3	A + Looked at advertisements while waiting for a friend.	14	1.33	.37	.01
22	C + Attended a lecture held in library's meeting room.	22	.35	.38	-.93
15	C + Went to check out a book, but it wasn't available. You left, planning to try again next week.	23	.23	.37	.78
7	You scan journal in library, but don't subscribe. You see about 25% of the issues this way. Would you say you regularly "use" the journal.	29	-.52	.41	-.69
5	You subscribe to a journal, but have only time to scan carefully 3 or 4 of the 12 yearly issues. Would you say you regularly "used" the journal.	30	-.68	.40	-.40
6	You scan journal in library, but don't subscribe. You see about 25% of the issues this way. Would you say you "read" this journal.	30	-.75	.45	.55
10	B + Would you say you "used" book if you glance through only to see how conventional diagrams are now being represented.	30	-.78	.41	.58
4	You subscribe to a journal, but have only time to scan carefully 3 or 4 of the 12 yearly issues. Would you say you regularly "read" the journal.	31	-.81	.41	.39
18	C + Brought own materials into library to study.	32	-.96	.44	.64
12	C + Went to duplicate an article in a journal you already knew the library had.	34	-1.31	.46	-.59
16	C + Went to check out a book, but it wasn't available so you had it recalled.	36	-1.74	.59	-.87
9	B + Would you say you used library if, after seeing publisher and copyright date, you return it to shelf.	38	-2.34	.67	.02
11	B + Would you say you used library if you glance through book only to see how conventional diagrams are now being represented.	40	-3.52	1.10	1.18
2	A + Looked up an article you were referred to. After examining it, you decide not to use it.	41	n/a	n/a	n/a
19	C + Checked out a book, but soon found it not useful and returned it.	41	n/a	n/a	n/a
13	C + Checked spelling of a name by referring to card catalog.	41	n/a	n/a	n/a
21	C + Had online search performed.	41	n/a	n/a	n/a
1	A + Read titles/abstracts of several articles before deciding none was useful.	41	n/a	n/a	n/a

CONDITIONS

A: Would you say you "used" library today if you obtained a journal in that library and ...

B: While looking for a book in stacks you notice a book you weren't aware of with a title suggesting it is on same topic. You glance through it ...

C: If asked how often you "used" the library, would you count the time when you ...

tual quality and is therefore more closely associated with traditional library operations. Actions that require interaction with library personnel or procedures are among the least difficult to agree with. Examples are checking out a book—even though it proves not to be useful—recalling a book, and having an online search performed. All of these have either low difficulties or were seen as library uses by all subjects (and so could not be scored).

There appears to be a difference in the perception of the concept of use as it relates to libraries and library materials. An item asking whether a book was used when its publisher and copyright date were

noted and then it was returned to the shelf was the most difficult to agree with. However, a similar item, asking whether the same interaction constituted a library use, was one of the easiest items.

In examining item fit, we first look at the ordering of items by difficulty estimates to see if it makes sense. Our results do seem to be a subjectively reasonable ordering. Similarly, the pattern of responses shown in Table 2 seems compatible with what we would expect if the model were correct. Beyond these observations, we look at the fit statistic (the standardized weighted mean square residual figure). When this is more than 2.00 or less than -2.00, it indicates a significant lack of fit. That is, the item's standardized mean squared residual is more than two standard errors away from its expected value of zero. T distribution tables tell us that such a deviation would occur by chance only 5 percent of the time. Therefore, we consider such a deviation from modeled values to be significant and reject the item as not fitting. In our case, however, all items are acceptable. The largest fit statistic is item 11's 1.18—well within the ± 2.00 limit. In other words, our subjective sense that the pattern of responses is compatible with the existence of an underlying scale is confirmed by formal analysis—discrepancies from perfect scaling are explainable by the probability model.

Examining the measure column of Table 3 shows that the distribution of our items is not uniform over the length of the scale. We would prefer that items were evenly spread out, rather than clustered, as we find around values -1.00 and 3.10. Including several items with similar or equal difficulties does not harm the scaling process; the additional items are just superfluous. There is even an advantage to developing an item pool that includes multiple items at each difficulty location. With this, tests and/or questionnaires can be developed that use different items while representing equivalent difficulty distributions.

We would, however, prefer to eliminate significant gaps between item measurements. As Table 3 illustrates, there are gaps in our scale between values -3.5 and -2.3, -0.5 and 0.2, 0.4 and 1.3, 2.0 and 3.1. Filling in gaps between item difficulties makes more precise person measurement possible. To improve our scale, we would need to design additional items that fall within the gaps observed. The questionnaire could then be readministered and item difficulties recalibrated to locate the new items on the scale.

Finally, we would like our scale to include as many easy items as hard ones. Our scale is slightly weighted toward the easy side, as we have ten items with negative difficulties, but only seven with positive difficulties. The estimation procedure we used centers the item difficulties around a mean value of zero. Ideally, we would also like the median difficulty value to be zero. When items are evenly distributed over both positive and negative halves of the scale, measurement becomes more precise.

Person Analysis

Person ability estimates from the MSCALE program are organized in the same fashion as item measures. High scores indicate a strong

willingness to agree with questionnaire items while low scores indicate agreement with only the easiest items.

Fit statistics indicate that there are two nonfitting persons, 25 and 34. If we examine the data matrix (see Table 2) we see the response inconsistencies that lead to the high fit statistics.

The columns of the data matrix contain the responses to individual items. The bold line cutting through the matrix indicates the point at which the item difficulties overtake the person abilities. In other words, this is the point where the most likely response changes from one (agreement) on the left of the line to zero (nonagreement) on the right. As our model describes, persons with high scale values are expected to agree with more items than those with lower values. The position of this line demonstrates this expectation. In the Guttman model, a perfect scale would show all ones to the left of this line and all zeros to the right.

The arrangement of the data matrix allows us to see inconsistent responses at a glance. Looking at the row for person 34, we see that this person, who tended to agree with most items, unexpectedly did not agree with three items, including item 11, which for most subjects was the easiest item to agree with. Person 34 also unexpectedly agreed with item 8 which was the hardest one to agree with. While the model allows for an imperfect response pattern, extreme inconsistencies are unacceptable. Subjects who exhibit them cannot be measured on the scale, and if many such subjects existed, the concept of an existing scale would be called into question.

Sometimes examination of the items responded to unexpectedly by a subject reveals a difference between the outlook of this person and the outlook of those who can be measured by the scale. If we examine the responses of person 25, we see a possible pattern. This person, who agreed with most items, unexpectedly did not agree with items 4, 10, and 6, and unexpectedly agreed with items 20 and 17. Items 4, 10, and 6 deal with reading and use of library materials as opposed to the library itself. Items 20 and 17 deal with library use. This person appears to be exceptionally willing to see something as an overall library use, but apparently is much more conservative regarding statements concerning the use of library materials. While for most people these constitute a single scale, for some two scales seem to be required.

Our subjects were selected from three populations. Ranking the subjects by their score shows how the measurement of subjects relates to these three categories (library school students, librarians, and nonlibrarians). The librarians all scored in the top half of this ranking, an event that could have occurred one time in sixteen by chance. Students and nonlibrarians appeared in both halves of the list—at the very top as well as at the bottom.

In this study, we have not included enough nonlibrary school students to see any real group response patterns. If more had been tested, we would anticipate two possible patterns of response. One is that those

with library training would tend to score higher than those without, as this training might be sensitizing students to the information and community services libraries may offer. The other response possibility is that those with library training would score in a midrange, while those without such training would score in either extreme. This would reflect the idea that those with library training are open to all the information potential of a library—including chance encounters with library material whether or not that material is useful at the time of its discovery. These people, however, might not see noninformation seeking tasks, such as meeting friends or restroom use, as being related to the library's function. Nonlibrarians, on the other hand, might have a less sophisticated, more black and white attitude toward the library. They may see nearly every activity carried out in the library as a use, or they may see only successful, traditional activities as uses (resulting in either very high or very low scores). The nonlibrarians we questioned seem to fit this last pattern, though, because of their small numbers, this can readily be dismissed as a chance effect.

CONCLUSION

Our results indicate that: (1) a personality characteristic (or attitude), herein referred to as library sensitivity, does exist and can be scaled by means of Rasch analysis, and (2) this trait influences how one responds to questions about library activities. There are, of course, several ways in which the current scaling project could be extended.

As mentioned in the last section, our measurements could be improved by the development of additional items to fill in the gaps in the sensitivity scale. It might also be useful to see if new items relating to the sensitivity concept, but not following the "use" line of questioning, could be successfully integrated with the existing scale. These extensions should enhance the robustness of the scale, enabling its measurement to be more precise.

To check further the appropriateness of the model, we might test the consistency of item calibration as follows. Items could be divided into two equal groups—most of the easiest items in one group and most of the more difficult in the other. Each could be given to a different group of subjects. Using the response data, items could be recalibrated for each group. Some item values would be estimated twice—once for each of the two item sets. If the model fits, we would expect the difficulty estimates for each item measured twice in this test to be similar to each other, and, within group translations, to be similar to the estimates described in this article. Our concern here is whether context is influencing the responses.

Although the scaling model arose out of research on questionnaire design, and it was to illuminate the problem of ambiguity in questionnaires that led us to carry out this investigation, the current scale might also be applied in quite different lines of further study. Our scale could

be used to examine correlations between library sensitivity and a variety of demographic and sociometric variables. For example, we could test the relationship between library sensitivity and variables often thought to influence information-seeking behavior, such as education and income. We could also look at the scale values of men versus women, librarians versus nonlibrarians, etc.

As detailed in the Rasch Model Applications section of this article, the Rasch techniques demonstrated here could be extended to other problem solving applications in information studies. We suggest, for example, Rasch analysis of interindexer consistency. Do variations in indexing perhaps result, in part, from response differences between indexers regarding the concepts being indexed (as opposed to variations stemming from differences such as specialized subject training or level of indexing experience)? If so, can such perceptual differences be controlled through training in order to attain greater interindexer consistency?

We also suggest Rasch applications in the area of library acquisitions, using the model to develop peer groups of libraries for the purpose of comparing holdings and discovering subject coverage gaps. Thus, the Rasch methodology used here to analyze our questionnaire data appears to us to be a tool that can prove valuable for a wide range of investigations in the information sciences.

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The Model of Science and Scientific Models in Librarianship

TERRENCE A. BROOKS

ABSTRACT

GOLDHOR'S CHALLENGE TO LIBRARIANSHIP to find invariant, universal relationships among library variables is discussed. Scientific problem solving is seen within the context of Kuhnian science, and research in librarianship is considered as not having the characteristics of Kuhnian science. The work of librarianship is analyzed as primarily a discussion of values, or post hoc rationalization of events. It is concluded that library problem solving will not succeed until fundamental problems are addressed.

INTRODUCTION

Herbert Goldhor's (1972) *An Introduction to Scientific Research in Librarianship* is a textbook of the application of scientific methods to the solution of library problems. This discussion examines one part of the scientific method, the use of theoretical models, as a partial explanation for the apparent lack of progress in solving library problems.

A model is a mental framework for the experimental manipulation of library and information variables, their measurement and evaluation, and the production of knowledge about libraries. A scientific model serves to define variables, shape crucial experiments, and predict results. Historically, library models have been cast in the narrow framework of operations research formulas of a library or as a library process such as circulation activity. It is often a larger unstated philosophical research model, however, that gives mathematical formulas their relevance and explanatory power.

At present there is no dominant theoretical research framework in

library and information science. There is a cosmopolitan research front with many different methods being used within many different research frameworks. Unfortunately, there is little overlap of methodologies among theoretical frameworks, thus thwarting the sharing of knowledge and the comparison of results. By contrast, it is clear that Herbert Goldhor's model of research in librarianship is predicated on the discovery of invariant, universal causal laws existing among library phenomena.

The scientific method of inquiry itself makes certain assumptions, and not everyone in the field of librarianship accepts them as true. One of these is the assumption that invariant, universal causal relationships exist between variables—such as books and readers; if this assumption is indeed false as regards books and readers, and if, instead, the individual occurrences of a phenomenon in librarianship are governed largely or entirely by chance or accident, then research in this area of librarianship is doomed to failure. (Goldhor, 1972, p. 14)

The argument of this discussion is that the current methods of research in librarianship preclude the discovery of such universals.

GOLDHOR'S CHALLENGE TO LIBRARIANSHIP

Just how difficult can library problem solving be? Surely it doesn't rank up there with brain surgery or cancer research. Isn't it just a subspecies of management science, psychology, or even sociology? Can't we borrow some techniques from an allied social science and clean up these library problems? Libraries have been around for thousands of years, why haven't these problems been solved long ago?

Some typical problems of librarianship are:

1. *Collection building.* Collection development officers in all types of libraries use their accumulated skills and wisdom to select relevant items from publishers' lists. This is done everyday in thousands of libraries. This activity, however, rests on problematic foundations. Disregarding the selector's strongly held belief in the efficacy of his work, however, how is the relevance of his selections affirmed?
2. *Online database searching.* Online searchers in all types of libraries use their accumulated skills and wisdom to select relevant items from online databases. There is something problematic about this activity, too. Disregarding the online searcher's strongly held belief in the power of computation, how do we demonstrate that relevant items were retrieved?
3. *Assisting people in finding information.* Everyday, reference librarians answer questions by supplying relevant information. But this too is problematic. Disregarding the reference librarian's fervent belief in acting in the public good, how is the relevance of her answers proven?

These examples illustrate that librarianship can function quite successfully despite a shaky theoretical underpinning. That is, the daily

tasks of librarians can be performed, despite the fact that there is no general agreement among librarians—or anyone else—as to what information is, or what relevance means, or what the two together (that is, “relevant information”) might be. This ranks as a major irony in the profession because an outsider would surely consider these concepts to lie at the very heart of library problem solving. What is the purpose of library management techniques—managerial accounting, output measures, operations research models, cost/benefit ratios, evaluation research, and so on—if not to help librarians collect and disseminate relevant information? A reductionist could claim that the concept of relevant information drives all library work. A reductionist could even claim that there would be no need for library problem solving if libraries would simply select, store, and supply relevant information in the first place. He would argue that the practical problems of librarianship derive directly from unresolved theoretical problems such as the identification of information, the meaning of relevance, and so on.

The reductionist argument makes the professional research agenda clear. We have only to hone methodological skills to meet these challenges. Goldhor's work falls squarely here in terms of shaping the research agenda and upgrading the research approach. He urges us to employ a positivist methodology of experimentation and measurement to find universal relationships among library variables. Such positivism is in the mainstream of modern science where truth is equated with fact as revealed by scientific experimentation. Unfortunately, the research experience so far seems to indicate that information resists identification and measurement, and relevance may be a chimera. Despite Goldhor's urgings, librarianship is not yet a science because its central theoretical problems remain unsolved (House, et al., 1978). Librarianship is thus orbiting a theoretical black hole. It has for centuries. This is clearly one reason why there are still unsolved library problems.

Many other academic disciplines have found themselves in a similar situation. The common solution is to apply the precepts and methodologies of the sciences to solve fundamental theoretical problems. The natural sciences have often served as a model of scientific endeavor for peripheral or emerging disciplines. There is, in fact, a tradition in librarianship decrying the unscientific attitudes and simple pragmatism of librarians (Butler, 1938). Since the roots of librarianship lie in the book arts and humanities, concerned and ambitious librarians, such as Herbert Goldhor, have envisioned their craft evolving into a science. He urges that the folk wisdom and craft methods of librarianship be systematized into scientific laws and theories. He issues a very important and difficult challenge to the profession of librarianship—his challenge is to transform the practice of a craft into a laboratory science.

SCIENTIFIC PROBLEM SOLVING

More than a decade has passed since this challenge was issued, yet

the fundamental nature of librarianship is unchanged. The field has been largely indifferent to Goldhor's passionate advocacy of the scientific method. It has resisted becoming something that it is not—a science—but then it hasn't failed either. The field continues to expand in two areas: the institutional studies of library science and the noninstitutional studies of information science. Both of these have the feel of science to the committed insiders who busy themselves with study and research. Despite extensive theorizing and some empirical work, however, library science is still a craft, and information science has only the promise of a science. Neither discipline exhibits the characteristics of science as described by Kuhn (1970). In a Kuhnian science, investigative work is organized by intellectual structures called paradigms, examples being Copernican astronomy, Newtonian physics, Einsteinian relativity, Darwinian evolution, and so on. Scientists work within such a paradigm applying its rules to specific cases, relying on its structure to devise theoretical explanations, seeking its predictions, and generally doing work that refines or elaborates the paradigm.

Few people who are not actually practitioners of a mature science realize how much mop-up work of this sort a paradigm leaves to be done or quite how fascinating such work can prove in the execution....Mopping-up operations are what engage most scientists throughout their careers. They constitute what I am here calling normal science....No part of the aim of normal science is to call forth new sorts of phenomena; indeed those that will not fit the box are often not seen at all. Nor do scientists normally aim to invent new theories, and they are often intolerant of those invented by others. Instead, normal-scientific research is directed to the articulation of those phenomena and theories that the paradigm already supplies. . . . To display more clearly what is meant by normal or paradigm-based research, let me now attempt to classify and illustrate the problems of which normal science principally consists. . . . There are, I think, only three normal foci for factual scientific investigation....[first] solving problems....[second] predictions from the paradigm theory....[and third] articulate the paradigm theory. (Kuhn, 1970, pp. 24-25)

The record of scholarly work in the library and information sciences is not like this. Instead, research efforts have been episodic, isolated, and noncumulative. What else is to be expected of library school faculty whose teaching has been characterized as "non-research, experience-based, non-cumulative, subjectively selected, possibly additive and relatively out-of-date..." (Houser & Schrader, 1978, p. 124)? As time passes, the theory base of both library and information science appears to be evolving but not necessarily maturing. A variety of research procedures have been used, but few have become refined, and none have coalesced into paradigms or research models. The effect of intellectual fashion in library science can be seen just by examining the earlier compendium published by *Library Trends* (Garrison, 1964) concerned with library problem solving. Methodological fashions come and go. Most of the earlier work is simply ignored as each generation reinvents the field. Kuhn would not call this scholarly busywork normal science. Solving library problems is a noble pursuit, but any effort made without addressing fundamental theoretical problems first is nothing more than

the superficial application of a showy technique. It leaves an empty legacy that future generations of librarians, enamored of some new dazzling business, can ignore at little peril.

Yet the theoretical literature of library and information science grows apace: grants are received, articles written, findings discussed, and opinions traded. How can all this theoretical activity be explained in fields that are, as yet, nonsciences? How can so much effort not result in scientific results and the creation of scientific disciplines? Part of the explanation lies in the various models of science that an adventurous social scientist can employ today. Apparently there are degrees of being scientific—not all “sciences” are equally scientific. Goldhor urges us to employ a very strict kind of science to solve library problems. This is a narrow road that lacks the enticements of a more meandering way.

THE MODEL OF SCIENCE

In its popular usage, science has become a fuzzy concept. Traditionally, it has been epitomized by public procedures, precise definitions, objective data collection, and replicable findings (Behling, 1980). Such is the positivist tradition of knowledge production. But extreme objectivity is just one of six methods of social science research as presented by Morgan and Smircich (1980) and abstracted in Table 1. This table illustrates at least five other pathways available for social science research, ranging from the exploration of pure subjectivity to the historical method. It is likely that the advocates of each of these methodologies feel that they are really being “scientific.” An ecumenical attitude toward these many methods would permit the possibility that useful knowledge in the library and information sciences could be produced from any of them. The literature of library and information science certainly contains examples of all of these types. Consider the following sample selection.

- Information as subjectivity.* Fox (1983, p. 38) argues that information is not a process or event, that information is not in inscriptions or utterances, and that information has no spatio-temporal form at all.
- Book selection as semiotics.* Atkinson (1984) describes the psychological state of the book selector as influenced, in part, by the syntagmatic context of a citation. The syntagmatic context of a citation is composed of the string of signs—i.e., names and numbers—of the citation itself.
- Information as hermeneutics.* Hoffman (1980) argues that information is an integral part of texts themselves. Information is the aggregate of statements, facts, figures, and their meaningful connections. He could use his method to discover if there was more information in this paragraph than the following one.

This short list could easily be extended; there are so many voices, so many methods, and so many results. It is bewildering to regard all these

TABLE 1
SUBJECTIVE/OBJECTIVE CONTINUUM OF METHODOLOGIES
IN THE SOCIAL SCIENCES

	<i>Assumptions about nature of reality</i>	<i>Goal of research</i>	<i>Example research method</i>
Extreme subjectivity	Reality as a projection of human imagination	To obtain in- sight, revelation	Exploration of pure subjectivity
	Reality as a social construction	To understand how social reality is created	Hermeneutics
	Reality as a realm of symbolic discourse	To understand patterns of sym- bolic discourse	Semiotics
	Reality as a contextual field of information	To map con- texts	Gestalt analysis
	Reality as a concrete process	To study sys- tems process, change	Historical analysis
Extreme objectivity	Reality as a concrete structure	To construct a positivist science	Lab experiments, surveys

Source: From Morgan & Smircich. (1980). The case for qualitative research, p. 492.

claims as equally scientific. It is easier to ignore the greater part of research in the library and information sciences, and that is what most practitioners and researchers do. This can be done with impunity because the first five methodologies in Table 1 produce results that are not generalizable beyond the author's own work or insights for the following reasons:

1. *The uniqueness of a particular analysis.* General laws are difficult to generate when specific libraries, automation systems, user groups, and so on, are described. An extraordinary amount of library "research" is no more than recollections of particular libraries or library practice.
2. *The temporal instability of a particular analysis.* With the march of time, people, institutions and automation systems either grow and flourish (and therefore change) or wither and die (and therefore change). General laws are difficult to generate when their focus of interest will transmute into another form within a year or two.
3. *The difficulty of measurement of a particular analysis.* It is difficult to generalize an analysis when the method of measurement is a private one. For example, only Hoffman can successfully apply his measure of information. The results of a private measurement technique may look like the product of a formal, public procedure, especially when dressed up with the appurtenances of statistical methodology, but it can't be duplicated by anyone else. A lot of library research is based on a nonobjective, informal, or unexpressed method of measurement.

To admit all the methodologies of Table I as being equally scientific is to debase the meaning of the concept. It fails to distinguish science from metaphysics, truisms, folk wisdom, fervent belief, or hokum. A scientific theory has the unique characteristic of being one that can be falsified, refuted, and tested (Popper, 1963, p. 37). Only positivist research makes empirical statements that can be falsified through experiment, refuted by evidence, or put to crucial tests. Other methodologies may provide insights, interesting comparisons, topics for debates, and so on, but their findings are not replicable, their methods are not objective, their definitions are not precise, and their procedures are not public. They are not scientific.

SCIENTIFIC MODELS

To transform librarianship into a science will require a systematic approach as well as a positivist methodology. The use of paradigms is the systematic method of knowledge production used in the sciences. A scientific paradigm is a set of shared concepts. One of the most distinguishing characteristics of a science is the sense of intellectual progress. Intellectual progress is achieved when paradigms or models are proposed, tested, changed, and tested again. Paradigms serve as the engines to advance knowledge. A paradigm gains adherents and status because it successfully solves long-standing problems that a group of researchers have come to recognize as acute (Kuhn, 1970, p. 23). Kuhn gives examples of paradigmatic work such as the intellectual achievements of Newton in physics, Copernicus in astronomy, and Lavoisier in chemistry. These paradigms reoriented their subject areas, set the proper methods of study and standards for solution, identified crucial validating results, and indicated directions for future research. Such paradigms identify a field of endeavor and act as intellectual micro-institutions (Toulmin, 1972, p. 166) to which anyone who takes up the study must commit himself.

No paradigm currently dominates the field of information science. If one were to be developed, it would at least have the following characteristics:

1. *The origin of information.* Does information originate with people, or in social interactions? Can machines, such as computers, originate information? Can an institution like a library originate information? Once it exists, is information actually inside a library? Inside a book? In a sentence? In a word? In a letter? In the ink of the letter on the page? In the spaces between letters? Do publishers and authors originate information? Where do they get it? Is there information inside a librarian? Is there information inside an online public access system? By selecting citations, isn't a librarian really creating information? Isn't a librarian then like a magician?
2. *The perception of information.* Can information exist without being perceived? Does an unread book contain information? How does one

person transmit information to another person as in a reference interview? Do reference librarians know all the information in a library? If they do, is the information physically inside a reference librarian? If it isn't, what information do they have? What is information about information? How can a librarian differentiate information from noninformation? Is it possible for two librarians to disagree about what is information?

3. *The manifestation of information.* Does information exist in a book or in any other container? Can the information in a container be separated from the container? How does a librarian compare the informativeness of two books? Doesn't this require the identification and measurement of information? How is that done? Books grow brittle and disappear; what happens to the information in them? If a librarian weeds a book, is the information also being weeded? Is it possible to lose information? If it is possible to lose information, then what does it mean to find information?

These questions could be greatly expanded upon. They are only the questions about information that may interest a library problem solver. These are the relevant theoretical questions to ask when a librarian selects a book to be acquired, determines a book for weeding, tosses an earlier edition, tells a patron where to look for an answer, and so on. These are the fundamental questions that library problem solving methodologies must ultimately address.

No paradigm currently dominates the field of library science. Since libraries are institutions that store information, any library science paradigm would necessarily be subsumed by the information science paradigm outlined earlier. But the library science paradigm would also be an institutional model that specified both the internal processes—such as acquisitions and cataloging—as well as external relationships—such as governance and client groups. The library science paradigm would organize into an intellectual whole all types of librarianship, all types of librarians, and all types of libraries and media.

It is unlikely that either of these paradigms will be seen in the near future. As a result, library and information science will continue, as in the past, to import ideas and techniques from other sciences and quasi-sciences in the hope of achieving a breakthrough.

Pessimism about the intractability of solutions to library problems can lead to two premature conclusions. First, that librarianship is somehow doomed to failure, as suggested by Goldhor. This is plainly not true, for the craft of librarianship goes on everyday despite a shaky theoretical foundation. The second premature conclusion is to dismiss the literary corpus of librarianship. Other social sciences have felt self doubt. Freese (1980, p. 63) calls growth in sociological thought more like a random walk than a cumulative progression. To appreciate the written record of librarianship, one must recognize that not all theoretical work has the same purpose. Wagner and Berger (1985) have de-

scribed a similar pessimism in the field of sociology where naysayers have derogated the value of theoretical sociology. Wagner and Berger suggest that there are at least two types of theoretical activity: orienting strategies that are statements of values, and unit theories that are proposals for specific experiments. This typology is also useful for explaining the nonscientific theoretical activity of librarianship.

ORIENTATIONS, INTERPRETATIONS, AND VALUE STATEMENTS

A large portion of the literary corpus of librarianship serves to orient values or to interpret the phenomena witnessed in the practice of librarianship. In trading opinions about values, library scholars can be very busy but never produce scientific results. For example, when library practice rapidly swings one way or another, driven by economics, a lot of post hoc theoretical rationalization is often necessary. Consider the case of undergraduate libraries. These libraries were introduced as places where young students could find a small collection of the finest books and possibly interact informally with their teachers. The values orientation of the 1930s and 1940s dictated that undergraduate students needed special library treatment. With the passage of time, the academic library establishment discovered the costs of maintaining a separate undergraduate library (Wingate, 1978), and there was a change in values. The new values orientation found it to be discriminatory not to permit undergraduates to use a research collection. In other words, library scholars generated a new values orientation concerning undergraduate libraries that fitted neatly with economic exigencies.

Statements of values or personal witness, like any personal statement, reflect their authors, time, and place. All are worthy because each is one element in the history on the subject. Each statement exists, whether popular or not, in the pantheon of possible points of view. The written corpus of librarianship becomes not a record of intellectual growth but more a record of witness. Consider the competing views of the origin of the academic library offered by Daniel Gore (1967) and Eldred Smith (1969). These value statements have similar beginnings, and even argument elements, while their conclusions are radically different. Both begin with reminiscence—they recall the early academic libraries run by a faculty member. Gore's version has academic libraries being wrested away from the faculty by the rising technical class of librarians. In his view, modern academic libraries are being run by librarian/bureaucrats who are not scholars. On the other hand, Smith focuses on the nature of academic library work, characterizing it as having two aspects—the professional and the clerical. In his view, modern academic libraries are run by professional librarians who are forced to be clerks/bureaucrats. Gore recommends the replacement of academic librarians with scholar/librarians, thus returning to the true origins of academic libraries. Smith recommends giving the professional library work to subject specialists, and letting a business manager/chief librarian take care of the clerical details. Both of these personal statements are worthwhile and add to the body of informed opinion concerning academic libraries. Neither is a scientific statement or paradigm; neither is wrong. They are merely personal opinions.

In librarianship, a lot of effort is spent defending values. Defense is needed when received values are challenged by the new definition of a concept or by threatening empirical results. As an example of the first case, consider the problem of the various meanings of "research strategies" that Jane Robbins-Carter (1986) addresses in an editorial in *Library & Information Science Research*. She defends an older value set that defines "library research" to be research about libraries. She has to defend this meaning from upstarts who would define "library research" as bibliographic instruction.

Empirical results are always a threat to received values because they have the aura of science and can be used as ammunition by the critics of the received values. Librarians do their jobs in political environments; they are naturally loathe to give their critics an advantage. Consider the reception given to the University of Pittsburgh study (Kent, 1979). This study analyzed circulation patterns and found that about 40 percent of academic library acquisitions don't circulate during their first seven years, and that such material has a miniscule probability of circulating thereafter. There are numerous ways to interpret such an empirical finding. Defenders of the status quo in academic libraries immediately recognized the Pittsburgh study as a potential threat to the continued funding of library book budgets. They sought to neutralize any possible threat of such intrusive empiricism. This was done by Schad (1979) who disputed the exact percentages of the study. His strongest argument was not quantitative or even methodological, but based on values. He claimed that the Pittsburgh study did not demonstrate comprehension of the purpose of academic librarianship. In support of this argument, a competing model of academic libraries was immediately offered. Voight (1979) proposed that the majority of scholarly use occurs inside an academic library, thus invalidating all circulation studies. In this way, the perceived enemies of academic libraries (such as university budget officers) are deprived of any potential weapon.

A large percentage of the theoretical work of library science has to do with values orientation such as the defamation of the Pittsburgh study. As the craft becomes more technical, however, there are more instances of experiments, unit theories, or, as Goldhor called them, service studies.

EXPERIMENTS, UNIT THEORIES, AND SERVICE STUDIES

A unit theory stands on its own, expressing some correlational or causal relationship. It is limited in scope and is much less than a paradigm—these theories are not attempting to explain everything. Merton (1957) has described such theories of the middle range, and Goldhor (1972, p. 8) introduced the idea of a service study—i.e., a small empirical study to improve a library's service. Many doctoral dissertations fall into this category. These unit theories permit some empirical test and a resolution based on measurement. As examples, consider the

theories describing the statistical relationships among library output measures presented by both Childers (1975) and Brooks (1982). Crawford (1984) has presented an ideal relational database design. A classic example of unit theories are the Clapp-Jordan (1965) formulas. Trueswell's (1976) work could be tested. Other theories abound. All are testable although not many are actually submitted to an empirical evaluation and then widely distributed as would happen in a scientific discipline.

Since the testing of empirical theories is relatively new to the science of libraries and information, researchers must struggle with very elementary things such as the formulation of basic concepts. Consider the problem of measuring information using Bradford's law of scattering, the hypothesis being that a literature has a core zone made up of the most important journals and subsequent zones of less productive journals. Fifty years ago, S.C. Bradford (1934) partitioned some sample literatures into three zones and noted a multiplier effect among the number of journals in each zone of the partition. Later researchers, such as Brookes (1968) and Leimkuhler (1967), used graphic techniques to measure the multiplier as the slope of a line. O'Neill (1973), however, demonstrated that these methods are correlated with sample size. Goffman and Warren (1969) suggested an alternative method of producing Bradford multipliers. Another approach was suggested by Egghe (1986). Brooks (in press) demonstrated that both the Goffman/Warren and Egghe approaches were method bound. In response, Egghe (in press) has suggested a group-free Bradford multiplier. After fifty years, it is still unclear how to produce a Bradford multiplier, a fundamental unit of measurement of information science.

This sketch illustrates that library and information science has yet to operationalize successfully even so fundamental a concept as literature clustering. The price of this confusion is that emerging research leaders begin without a firm theoretical base. For example, Prabha (1984) did a Bradford analysis but allowed the counts for a single journal title to span more than one zone. Who is to say that this method is wrong? Pontigo-Martinez (1984) used four zones in his partition, instead of Bradford's three, or the greatest number possible using the method of Goffman and Warren or even the Minimum Perfect Bradford Partition (Brooks, in press). Who is to say that his method is wrong? An analogy might be that information science is where physics was when Galileo worked with falling objects or perhaps where chemistry was when Mendeleyev designed the periodic table of chemical elements. Right now information science is not a science but only the promise of a science.

CONCLUSION

Just how difficult is library problem solving? It appears to be

exceedingly difficult. The degree of difficulty is exacerbated by a popular focus on short-range management solutions instead of fundamental theoretical problems. Goldhor challenges us with the model of an exact, positivist science. Subsumed in such a model is not only an intellectual organization of paradigmatic science, but also a public, precise, reproducible methodology. This model of science is not currently reflected in the theoretical work of library science. Librarians are really engaged in a discussion of values about the institution of the library. Judging by its intellectual methodology and the focus of its interests, library science will never respond to Goldhor's challenge.

The model of science is hardly reflected in information science, either. Information researchers are just now struggling to codify concepts and agree on units of measurement. There is hope that information science will coalesce into a science at some future point. Real library problem solving awaits the development of a science of information, one that is organized in the model of a science and uses scientific models to produce knowledge. Until then library problems will be very hard to solve. While this article argues for the use of scientific methods in librarianship, it is not itself a work of science. It expresses a personal opinion and thus contributes to the ever increasing body of opinion characteristic of the literature of librarianship.

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Evaluative Research in the Library and Information Field

THOMAS CHILDERS

ABSTRACT

THE KEY CHARACTERISTICS OF evaluative research (ER) are outlined. Raizen and Rossi's fine-grained model of ER in education is applied to the library information field. Using published and unpublished examples of ER in library and information settings, the field's strengths and weaknesses in the various types of ER are explored. It is concluded that the overall volume of ER is reasonably good in the library and information field, but that it is fragmented and noncumulative, lacking sufficient basic research and research on the impact of libraries and information services and products.

THE NATURE OF EVALUATIVE RESEARCH

In some regards, evaluative research can be distinguished from other kinds of research:

- It is usually used for decision-making (that is, it is applied—in contrast to basic—research. It is clearly a tool for problem solving).
- The research questions are derived from a program, usually a service offered to a client group.
- The research provides a basis for making a judgment about the program.
- The research occurs in the environment of the program application, not in a laboratory and not in the respondent's study (there is some disagreement over this latter characteristic).

The methodology of evaluative research usually represents a compromise between “pure” research and the demands and strictures of the

applied setting, between maintaining the integrity of the research and providing data that will be useful for decision-making (Weiss, 1972).

The differences between evaluative research and other research center on the orientation of the research and not on the methods employed. Evaluative research has a problem solving orientation, implying movement and adjustment as a program moves from ideation through testing to full implementation and subsequent correction.

In other regards, evaluative research is not very distinctive. Neither the orientation of evaluative research nor the techniques through which it is carried out are unique. For instance, evaluative research is embodied in the "evaluation of alternative strategies" step often included as an element in a strategic planning cycle. In marketing, evaluative research is implied in any effort to evaluate the market penetration of a new product.

Is it possible that the nondistinctiveness of its orientation and techniques results in the lack of deliberate attention paid to evaluative research per se in many fields, including, in this writer's estimation, library and information science?

Program Orientation

To be evaluative research, an investigation must focus on a program (a service or a product) and on a consumer (client or customer, actual or potential). Its sole purpose is to assess the affect of a program on its consumer (Ruttman, 1977). Furthermore, evaluative research ordinarily studies actual programs in the field. While either experimentally implemented or fully implemented programs may be the subject of the evaluative research effort, laboratory experimentation, in the sense of isolating the research from environmental influence, is rarely considered within the limits of evaluative research. Field experimental research is the rule where experimental research is employed.

While some writers insist that program is the focus of evaluative research, others assert with equal strength that the evaluation of internal organizational processes (such as the efficiency of staff or the cost of providing services) is essential in a full agenda of evaluative research. In this case, everyone is correct; for in the ideal, an internal process would be studied only as it could ultimately be tied to program affect.

Impact Orientation

Evaluative research seeks to discover causal sequence or the impact of a program on its audience. It necessarily strives to determine a cause-effect relationship.

Formative-Summative Dichotomy

Evaluative research is commonly divided into two classes—formative and summative. Formative is the type of evaluative research that occurs during a program's implementation in order to make mid-course corrections; formative evaluative research may therefore put

considerable stress on such interim elements as how resources are being applied to a program and on the initial response of the audience to the program. Summative research occurs at the end of the program or at the completion of one cycle of a program in order to assess the impact of the total program. It may reinvestigate much the same things as formative research but will also include measures of program effectiveness, or impact and overall program efficiency. Although not recommended as exemplary research reporting, Doelker and Toifel (1984) demonstrate formative evaluation in the library and information field. They report the development of a library instruction manual for university students; in very broad strokes they use evaluative data gathered periodically to help revise their approach during the process of development.

Evaluative Research Methodology

Within the general evaluative research orientation, any research methodology can be employed. The ideal form for evaluative research—Weiss (1972, p. 7) calls it the “classic” form—is experimental:

- the target audience exists in a given state;
- the state is measured and described;
- a treatment or program is applied;
- that new state of the audience is measured and described; and
- measures of the old and new states are compared for differences—that is, effect attributable to the program.

However, virtually any other technique of research may be appropriated for evaluative research. Many of these will be mentioned or discussed later.

Quantitative/Qualitative

Evaluative research is normally conceived in quantitative terms, but it can be equally valid in qualitative form. For instance, information systems ethnography, an almost anthropological assessment of information exchange and transformation processes, may be used to evaluate the success of a “program” or system of information exchange in narrative unquantified terms. For a text on the subject, see Patton’s (1987) work on qualitative methods for evaluative research, one of the volumes in Sage Publication’s nine-volume “Program Evaluation Kit.”

Nonprofit Focus

Evaluative research is most concerned with the nonprofit sector. Its overriding focus is on programs that seek to better individuals or society. Strictly speaking, one can evaluate a profit venture, but the term *evaluative research* is ordinarily reserved for the public nonprofit sector. Terms like *market research* or *cost benefit analysis* would be used in the private for-profit sector to describe what might amount to evaluative research.

Fugitiveness

"In evaluation, probably the majority of study reports go unpublished" (Weiss, 1972, p. 7). Evaluative research remains largely unpublished. Fields with a large number of consumers and substantial resources at their command—such as education and health care—have generated massive evaluation studies and many of these have been published. Even so, the published literature in these fields is probably the mere tip of the iceberg. Beneath the surface lies a mass of internal and often proprietary reports that are by accident or design not circulated beyond the confines of the program or organization evaluated.

A BROAD MODEL OF EVALUATIVE RESEARCH

Attkisson and others (1978) proposed a relatively simple model of the levels of evaluative research, the management tasks typically addressed at each level, and typical evaluation activities (methods) appropriate to the level and to those tasks. The levels of evaluation proposed were:

- systems resource management (concerning inputs to the management system, internal processes of management, and relationships with external governors and funders of the service program);
- client utilization (concerning client access to service, the quantities and quality of service delivery, and the consumption of service by clients);
- outcome of intervention (concerning effectiveness of the service program from the individual client's point of view, including satisfaction with the services used); and
- community impact (concerning the state of the target community both before and after service intervention).

The levels graduate from input-oriented to output-oriented, through impact on the individual, and, ultimately, impact on the larger community. Other analysts might paraphrase "systems resource management" as "process evaluation" and combine the other three into "program evaluation" (Chelton, 1987).

The Attkisson model is mainly useful in that it points out the essential differences between consumption of service or product ("client utilization"), and the *impact* of that consumption on the individual and the community ("outcome of intervention" and "community impact"). This will be addressed again in later sections.

A FINER MODEL

Raizen and Rossi (1981) offer a finer model of evaluative research for the field of education, its purpose being to parse the overall process of evaluative research into specific component parts (see Figure 1). Like the model of Attkisson and others, the parts are roughly in order of their occurrence. In the Raizen and Rossi instance, they appear more or less in

the order of tracking a program from conception through full implementation. Their premise is that questions related to policy trigger particular general evaluation procedures in which particular specific evaluation procedures or research methods are used. To extend the model beyond its education application, one may interpret "problem" to include "opportunity," and "beneficiary" to constitute "patron," "client," "user," "nonuser," or "target population."

Evaluative Research and The Model

Stated broadly, the Raizen and Rossi model requires evaluative research to utilize the results of research in order to develop a market position for a program, describe the program's efficiency, and describe the program's effectiveness. The model has considerable scope, encompassing research beyond the strict limits of the program focus and—contrary to Weiss—accepting laboratory research as a legitimate method of evaluative research.

The elements of the Raizen-Rossi model, singly or in related clusters, are discussed below as they apply to evaluative research in the library and information field. The discussion is highly selective. Since the literature of evaluative research is so large and so much of it is fugitive—often recorded in no more than intramural memos—comprehending evaluative research in a given field is not feasible. Moreover, to the extent that evaluative research is methodologically indistinct from other types of social research (see the introductory discussion), aspects of it are found in a wide variety of writings—from writings labeled evaluative research; to writings labeled operations research, field experiment, statistical report, white paper, research, evaluation, measurement, and many more; to unlabeled writings.

Since it is virtually impossible even to enumerate or to comprehend the writings related to evaluative research within the field, the view will be impressionistic and based on the author's selections.

<i>Policy Question</i>	<i>Evaluation/Social Research Procedure</i>	<i>Research Methods Used</i>
How big is the problem and where is it located?	Needs assessment	Assembly of archived data (Census, NCES, etc.) Special sample surveys Ethnographic studies

Raizen and Rossi's questions at this stage focus on identifying and typifying the client problem or need. In the library and information field, examples of archived data are to be found in the reports on academic, public, and school libraries that have been published by the National Center for Education Statistics (NCES) and in the national data collection effort for public libraries spearheaded by the Public Library Development Project of the Public Library Association. Such data have been used to determine at the most general level the major

Questions Arising During the Formation of Policy and the Design of Programs

<i>Policy Question</i>	<i>Evaluation/ Social Research Procedure</i>	<i>Research Methods Used</i>
How big is the problem and where is it located?	Needs assessment	Assembly of archived data (Census, NCES, etc.) Special sample surveys Ethnographic studies
Can we do anything about the problem?	Basic research	Assembly of archived research studies Specially commissioned research
Will a proposed program work under optimal conditions?	Small-scale testing	Randomized controlled experiments Pilot studies and demonstrations
Can a program be made to work in the field?	Field evaluation	Ethnographic studies Randomized experiments Field tests and demonstrations
Will a proposed program be efficient?	Policy analysis	Simulation Prospective cost-effectiveness studies Prospective cost-benefit analyses

Questions Arising from Enacted and Implemented Programs

Are funds being used properly?	Fiscal accountability	Fiscal records Auditing and accounting studies
Is the program reaching the beneficiaries?	Coverage accountability	Administrative records Beneficiary studies Sample surveys
Is the program implemented as intended?	Implementation accountability	Administrative records Special surveys of programs Ethnographic surveys
Is the program effective?	Impact assessment	Randomized experiments Statistical modelling Time series studies
Is the program efficient?	Economic analyses	Cost-effectiveness studies Cost-benefit analyses

Figure 1. The Raizen-Rossi Model. (From Raizen, S. A., & Rossi, P. H. [Eds.] [1981]. *Program evaluation in education: When? How? To what ends?* Washington, DC: National Academy Press, p. 41.)

lacunae in library services such as those libraries falling below certain collection sizes or those regions where populations do not have adequate library access.

For nearly forty years, special sample surveys have been abundant in the library and information field with the purpose of determining the nature and magnitude of a hypothesized problem. A central core of such studies has aimed to identify clients and their library and information needs. The so-called "user studies" have most often occurred at the local

level and less often at the regional, state, or national level. The published literature holds myriad studies of perceptions of services, uses of services, users of services, and user satisfaction with services of public, school, special, and academic libraries and various types of information centers. It is certain that many more exist in unpublished form.

At the level of individual needs assessment, library and information science faces all the problems, and more, of any organization undertaking market research. Chief among these problems are identifying the client's true—as opposed to idealized or generalized—reactions to products or services; and projecting likely reaction to a proposed—rather than existing—product or service.

There are two additional problems for market research in the library and information field. They doubly confound the measurement or projection of user reaction to various library and information services. First, the field's twenty years of experience in trying to determine the value of its services suggests strongly that the perceived impact of library and information services is more subtle (less palpable) and diffuse than the perceived impact of many other services such as trash collection, meals on wheels, or, for that matter, police protection. It is inherently difficult to question a client on the value of a product or service that is subtle and diffuse. Second, the library and information world, with few exceptions, has not adequately set its service objectives, especially with regard to impact. In most library and information settings, neither managers nor clients have defined the dimension of impact and established the criteria by which to judge its achievement.

There are numerous other "special sample surveys" which are not focused directly on the use or user but have fairly direct implications for services offered and their consequent impact. Fiske's (1968) classic study of self-censorship and book selection among librarians and White's (1986) more contemporary analysis of data on librarians' attitudes toward censorship are examples of efforts to name and locate a professional problem that will impact directly on the quality of collections in libraries. Another set of indirect examples can be found in the many unobtrusive studies, beginning in 1968, of the answers that libraries and information centers provide to unambiguous requests for factual information (Crowley et al., 1971).

A large number of user studies performed over the past forty years, both published and unpublished, provide some degree of market knowledge. However, the knowledge provided is limited, for these studies have often tended to:

- poll only users since they are easier to poll;
- utilize only the grossest demographics as correlates of library use such as education, sex, age, occupation, and income;
- measure reaction only to existing services without attempting to project reaction to possible future services; and

—focus solely on the library or information unit and thus gain a particular rather than global perspective on the clients and their information states.

There are exceptions to this dismal pattern. In the years immediately following the launching of Sputnik in 1957, there was a substantial effort to explore communication patterns and information needs in the scientific and technical communities in this country. Performed often under the heading of "information science," the studies were global—not limited by institution or informational format—and they were generally methodologically creative. They generated broad insight into the doing of science as well as its communication and significantly advanced the understanding of information needs (Griffith, 1987).

Beginning in 1973, Dervin began developing a framework for assessing the global information need of the average adult. The framework has been improved and employed since then in a number of settings (Warner et al., 1973; Dervin et al., 1976; Chen & Hernon, 1982; Gee, 1974). Wilson used a similarly global approach in her study of the information seeking activity of community activists. Focusing on a "critical incident" related to the subject's interest, she described the information environment surrounding that incident and the effect of the information environment on the subject (Wilson, 1977). The study can be viewed as an evaluation of the impact of a social program (the public library) on the activities of the subjects and therefore will also be considered later in this article where program impact is addressed.

On a smaller scale, conjoint measurement has been used in academic libraries to identify client reaction to specific mixes of service characteristics. In this case, employing a parsimonious means of permuting features of library services, the study provided information for the market positioning of future services (Halperin & Strazdon, 1980).

Another approach that may enrich the field's perspective on client requirements for a library or information system is ethnography. While specific ethnographic techniques—such as key informant interviews, daily logs, and participant observation—have been employed to gather data on client need, studies are almost invariably cast in the vein of the standard scientific method, addressing the study question in quantitative terms. In contrast, in information systems analysis the ethnographic approach has been espoused—and used—to determine the states and needs of system clients. Qualitative presentations such as narrative argument, chronicles, and social network analyses have long been used in the area of information systems to offer a richer, more natural view of the human elements of an information system than afforded by the heavily quantitative and rigid scientific method. A recent example is Zachary et al. (1984) who make a strong case for the use of the ethnographic approach for information systems analysis. Its application to the information system design for an office of the National Park Service is

reported by Zachary et al. (1986). At the library end of the spectrum, Werking (1980) reports on two instances of qualitative evaluation (calling it "illuminative") of user education programs in Europe.

<i>Policy Question</i>	<i>Evaluation/Social Research Procedure</i>	<i>Research Methods Used</i>
Can we do anything about the problem?	Basic research	Assembly of archived research studies Specially commissioned research

"Long-range support for basic research on educational processes is critical for the development of the fundamental ideas for education programs" (Raizen & Rossi, 1981, p. 43). To fulfill the obligations of this stage of evaluative research, a field seeks broad understanding of the problem and its determinants. This is the moment in the cycle of evaluative research where one seeks to relate dependent and independent variables, to establish cause and effect relationships for the phenomenon at hand—in this case a library or information service. Basic research can inspire the invention or adjustment of service programs by identifying the variables on which to concentrate organizational resources. For instance, knowing the variables that correlate with student learning of online searching may lead to the design or redesign of a specific program in an educational media center—perhaps attaching such learning to particular classes or teaching online searching through a particular modality.

The library and information field has a record of published activity for this phase of evaluative research. Perhaps the best overviews of basic research relevant to the field—whether done inside or outside the field—can be found in review publications—e.g., *The Annual Review of Information Science and Technology*, *Advances in Librarianship*, *Advances in Library Administration and Organization*, *Library Trends*, and review articles in *Library and Information Science Research*.

Considerable basic research has been performed in the areas of citation and cocitation patterns in scholarly literature, collection obsolescence and overlap, information transfer among individuals, and demographic correlates of library use. The recently reported work of Saracevic (1988) and others is a good example of a major piece of basic research, in this case developing models of online searching behavior.

However, for the field at large, one would not characterize basic research as vigorous. It is pursued almost exclusively by the small academic subset of the library and information field consisting of doctoral candidates and a few persistent faculty researchers, and it attracts meagre funding. On the library side of the field, most of the research funded in the field is applied in nature, seeking to answer a specific question in a specific situation; information science and information systems seem to have a stronger tradition of basic research.

Although there have been significant basic research studies in the field, library and information science has never had the resources, either human or financial, to concentrate on studying the determinants of consumption or nonconsumption of library and information services or, especially, the determinants of library or information impact. On any particular topic, basic research is sporadic, offering the field a patchwork of knowledge about its programmatic effects.

<i>Policy Question</i>	<i>Evaluation/Social Research Procedure</i>	<i>Research Methods Used</i>
Will a proposed program work under optimal conditions?	Small-scale testing	Randomized controlled experiments Pilot studies and demonstrations
Can a program be made to work in the field?	Field evaluation	Ethnographic studies Randomized experiments Field tests and demonstrations

The library and information field has experienced numerous demonstrations, field tests, and pilot studies intended to assess the feasibility and likely impact of new programs. Many of these investigations have been buried in local situations and have never been published so it is difficult to assess their impact. Many others, some of them local, others regional or national in nature, have been published. Support for this type of investigation has come from the local unit's own budget (company, school, municipality, university), the federal government (administered centrally and through state library agencies), and some state library agency budgets.

Demonstrations, field tests, and the like have been one of the two most popular forms of evaluative research in the library and information field (it is matched by studies of program reach, discussed later). Historic examples include the Knapp Project, a demonstration of excellence in school library service (Sullivan, 1968); tests of the Management Review and Analysis Program, an organizational development model in academic libraries (Webster, 1980); demonstrations of outreach services in the inner city in the 1960s and early 1970s (Lipsman, 1972); trials of information and referral services through public libraries (Childers, 1975). More contemporary examples include the Siegel et al. (1984) evaluation of two prototype online catalog systems; trials of integrating DIALOG labs into undergraduate courses (Ward, 1985); and prototyping an information system for the National Park Service (McCain et al., 1987).

The studies of Siegel and Ward illustrate some characteristics of this type of evaluative research activity in the library and information field. Field tests, studies of demonstrations, and the like commonly do not investigate the efficacy of one means of conducting a program versus another means, as in the Siegel report. Instead, as in Ward, one and only one solution to the problem is evaluated; alternative solutions to the client need are not explored.

Moreover, as exemplified in the Ward report, control groups are commonly not used, so the measurement of only the treatment group does not correct for the many possible sources of contamination of study results. As with many evaluations in this field, the concern seems to be with promoting a particular solution to a client need rather than rigorously testing that solution.

Properly randomized controlled experiments do exist. At a substantial level, one recalls Knapp's (1966) classic Monteith College experiment in library instruction. More contemporary and much more modest is the test of the effectiveness of a computer- versus card-form catalog (Armstrong & Costa, 1983), and Harris and Michell's (1986) assessment of the effects of gender and communication behaviors on competence at the reference desk.

<i>Policy Question</i>	<i>Evaluation/Social Research Procedure</i>	<i>Research Methods Used</i>
Will a proposed program be efficient?	Policy analysis	Simulation Prospective cost effectiveness studies Prospective cost-benefit analyses
Are funds being used properly?	Fiscal accountability	Fiscal records Auditing and accounting studies
Is the program efficient?	Economic analyses	Cost effectiveness studies Cost-benefit analyses
Is the program implemented as intended?	Implementation accountability	Administrative records Special surveys of programs Ethnographic surveys

For the most part, the above policy questions concern elements of internal control—i.e., cost, internal processes, and technologies employed in mounting a program. While there are published investigations of cost, processes, and technologies related to particular library and information programs, most of such investigations are probably buried in the files of the organizations for which they were performed. The more public of such investigations will be found as part of a budgeting document, a planning paper, a cost-effectiveness or cost-benefit study, an operations research exercise, or other management inquiry. They are also often evident in technological reports evaluating large service innovations. The New England Academic Science Information Center (NASIC) trial of online bibliographic search service to academics in the mid-1970s typifies one kind of analysis. It consists of a simple costing of activities engaged in during the trial period without attempting to compare alternative means of offering the service nor determining the relationship between cost and payoff to the user (Wax & Vaughan, 1977). Another example of an investigation of internal control, and one more consistent with the true orientation of evaluative

research, is the report of a Canadian trial of telefacsimile transmission for interlibrary loan. While the report does not include rigorous testing of alternative means of exchanging physical documents, it does compare the telefacsimile means with the traditional postal alternative in terms of costs and benefit to the user (Anand, 1987). White (1986) offers a unique approach to evaluation which addresses at the same time marketing strategy and "a library's ability to respond to social needs in the area of lifelong education" (p. 116). He proposes that a library examine its intentions and strategies for introducing an innovative program directed at social change (e.g., literacy or lifelong learning). To do this, one renders advertising copy for the program into the typically terse, communicative, and competitive language of the yellow pages. If one is unable or unwilling to do that, one must assume the program or its administration is in some way deficient. The method is wholly qualitative in nature, a relatively rare occurrence in the field.

There seem to be two recurring blindspots regarding evaluation and internal control elements in this field. One is that alternative means of achieving ends are rarely compared in terms of their cost and their payoff. Most often a single means is considered, and the power of comparing one means to another which, to a large extent, makes evaluative research evaluative, is lost. The second blindspot is that many of the costing exercises in the field tie costs to organizational inputs and administrative processes and fail to consider adequately the benefits to users. Thus cost, processes, and technologies are unrelated to the ultimate objective of the library or information organization and true evaluation, in the evaluative research sense, cannot occur.

<i>Policy Question</i>	<i>Evaluation/Social Research Procedure</i>	<i>Research Methods Used</i>
Is the program reaching the beneficiaries?	Coverage accountability	Administrative records Beneficiary studies Sample surveys

This phase, along with demonstrations, field tests, and the like, is one of the two phases of evaluative research which seems to be most often considered by library and information practitioners and researchers to be evaluative research. It is often seen as equivalent to a program's impact and substitutes for assessing how a program has bettered a person's life. More specifically, describing the reach of a library or information program is probably the most common means of assessing program impact in the field. Perhaps reach is a natural preoccupation, for most libraries and information centers assume that reaching as many of their assigned constituents as possible to be a mandate. Furthermore, it may also capture the field's attention because it is far easier to assess—being more concrete—than is true impact.

Studies of program reach have included population characteristics of users and sometimes nonusers of virtually every library and information service. These are often called community studies or community

analyses. Summer reading programs, bibliographic instruction, online searching, information and referral services, selective dissemination of information services, book display trials, and every other direct user service have been subjected to demographic analysis. Common user variables include age, sex, education, occupation, status within the client group (such as socio-economic status, student class, or organizational position), frequency of use of the library or information center, and nature of the services used.

<i>Policy Question</i>	<i>Evaluation/Social Research Procedure</i>	<i>Research Methods Used</i>
Is the program effective?	Impact assessment	Randomized experiments Statistical modelling Time series studies

The seminal question in evaluative research is the question of effectiveness. In the services realm, where one's ultimate objective is to make a difference in a person's or a community's life, the question may barely be answerable with existing research methodologies, or the research methodologies required may be so expensive as to preclude pursuing the answer.

In the library and information field, studies of reach far outnumber studies of impact. Perhaps it is because the former are easier to conceive and execute. Statements of reach have come to be used as statements of program impact in this field. Unfortunately, assuming impact from reach requires assuming that program consumption (e.g., a book circulated) is equivalent to program impact (improvement in the person's information base or increased decision-making facility). There is no evidence to support the assumption.

If one sees the ultimate mission of this field as optimizing the consumption of library and information services and products, impact on the person is irrelevant and true evaluative research, to the extent that it is concerned with an improved state of the individual, also becomes irrelevant. If one sees the ultimate mission of the field as improving the state of the individual, impact on the person must be considered, and one must engage in true evaluative research in order to assess the field's success or failure. Students of library and information science easily recognize that the field is quite ambivalent on this issue, its literature frequently espousing the mission of improving the person's state (decision-making ability, job performance, leisure happiness, creativity, political empowerment, etc.) yet rarely assessing the degree to which a person's state has been improved.

A major problem in evaluative research in the library and information field is that it is often not treated seriously. It is frequently added to a demonstration or full program implementation as an afterthought and without sufficient resources or sufficient expertise. It is often executed at an elementary level, contributing nothing to the field's overall

understanding of the impact of its programs. This is particularly the case in evaluating a program's effectiveness or impact. Frequently, the evaluation method is not integrated into the overall project, and thus, as often happens, true experimental research (with before and after testing) is foregone. Ex post facto research, with its very limited capacity to explore before-and-after changes in a person's state, becomes the only course of action. There are sufficient examples of impact evaluation in the field to show the way but not enough to characterize the field as one overwhelmingly concerned with its impact or effectiveness.

One example, again, is the Monteith College Library Experiment, a trial and evaluation of means of incorporating library services into the instructional program of a college. This was an extensive evaluation and utilized before and after testing as well as multiple measurements of impact such as improvement in performance on assignments. Qualitative measures were used. The evaluation was of the formative type, helping the development of the library-instruction program (Knapp, 1966).

A less ambitious example is found in an evaluation of a new year-round reading program for Los Angeles children, assessing children's reading activities before the program started and remeasuring it at the program's end. Although the findings did not support the hypothesis of improved reading activities, the investigation shows that the evaluation of impact can occur (Markey & Moore, 1983; Markey, 1986).

A third example is the study of impact on library skills of a program of bibliographic instruction at several colleges in the northern midwest. Surprenant (1982) employed before and after testing and control and experimental groups in a classic experimental approach.

WHERE DO WE STAND?

For the library and information field, reviews of evaluative research literature are rare, with Powell's (1984) review of evaluations of reference services being the only one located with that label. Several tutorials on evaluative research exist, including one for children's librarians, a series in *American Libraries* for general library evaluation, and another incorporated in a book on action research (Chelton, 1985a; 1985b; 1985c; 1986a; 1986b; Swisher & McClure, 1984).

Viewed simply in terms of quantity, evaluative research in library service appears reasonably strong. A search of *ERIC* and *Library and Information Science Abstracts* during the period 1982 through 1987 yielded approximately 140 items that indicated from their title or abstract that they dealt with evaluative research. It must be assumed, based on personal contact with library practitioners and program content at national conferences, that a substantial number of evaluative research efforts are carried out in the privacy of the individual library or through a collaboration among a few. An example of a substantial

internal effort, collaboratively done, is an unobtrusive study of reference service undertaken by Fairfax and Arlington counties, Virginia, and Montgomery County, Maryland (Rodger, 1984). Many such studies are never published.

The nature of the evaluative research effort in the library and information field varies from an ongoing, serious commitment (such as in the systems offices of a few major public libraries and numerous large academic libraries); to a periodic effort which relies on existing staff and is relatively simple in its methodology and limited in scope; to an occasional effort which involves existing library staff in collaboration with available local research experts; to no effort at all.

Evaluative research in the field is fragmented and noncumulative. And it is unsupported by the basic research that would permit wiser experimentation with programs, such as the value of electronic linking of networks for daily problem solving among the elderly. However, some of the basic research exists outside the field. Examples include the vast amount of research on reading and children, on adult basic education, and on organizational behavior.

Not all phases of evaluative research, as viewed through the Raizen and Rossi model, are equally attended to in the library and information field. Basic research and research on program impact constitute the most important areas of neglect—neglect which indicates that the field is not pursuing a full menu of evaluative research and that the keystone of evaluative research—program impact—is largely missing.

In the ideal, evaluative research seeks to discover how a particular program has affected people. In reality, service fields in general and libraries and information operations in particular often resort to evaluating not the effect of a program but program offerings (such as number of compact discs available for circulation in a new compact disc service) or program transactions (such as the number of circulations of the new compact discs). Of the three major evaluative research options—quantities and qualities of program (i.e., products or services) offered, quantities or qualities of program consumed, and impact of consumed program on the individual—this field has commonly opted to evaluate at the two least telling points in the service cycle—offerings and transactions—and thus has opted not to learn how it has affected people.

Much of the evaluative research in the field is of the post-fact quasi-experimental variety, when it would ideally be true experimental. In the former category, two studies by this author include an evaluation of Pennsylvania public library systems and the Five Cities information and referral center evaluation (Childers, 1988). Examples of true experimental design in evaluative research are to be found in McClure and HERNON's study of reference effectiveness, wherein reference performance was measured, a treatment (training program) was applied, and performance was again measured; and in an in-progress evaluation of the effect of a technology innovation on three college libraries cooperat-

ing in its adoption (Hernon & McClure, 1987; Childers & Griffith, 1988). One of the constraints in adopting true experimental approaches is that federal and state timetables for grants and contracts have frequently disallowed sufficient time for pretest/treatment/posttest design, so that evaluation has been almost completely post-hoc or "pre-experimental" (Houston, 1972).

The practical bent of the field, too, and of many of those who have awarded funds for program and research, has resulted in there often not being a substantial effort devoted to evaluation. The result is often that persons whose desired role is executing a service program are required also to assume the role of evaluator—a conflict of interest in many cases, and a situation that one would expect to result in half-hearted and amateurish evaluation methods. (Reviews by this author of numerous papers submitted for publication and grant proposals support the latter proposition.)

To the extent that the field is inadequately developed in the Raizen-Rossi cycle of evaluative research, the field is inadequate in the mechanisms useful for problem solving; for evaluative research is fundamentally a problem solving tool. The efforts of the past forty years are encouraging. Although moving slowly, the field does seem to be making advances on various phases of the evaluation cycle. Yet it is obvious that there is substantial work yet to be done before the mechanisms and orientations necessary for a full cycle of evaluation will be available.

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Output Measures in Libraries

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ABSTRACT

AN IMPORTANT TREND in library management over the last two decades has been the increasing use of measurement for management decision-making. The purpose of this article is to trace briefly the history of the use of performance measures in libraries and to discuss some issues in the use of such measures for decision-making and problem solving.

PERFORMANCE AND OUTPUT MEASURES

Performance measures was a key phrase in the 1970s (DeProspero et al., 1973). In the 1980s it was replaced by *output measures* (Zweizig & Rodger, 1982; Van House et al., 1987). Although these terms are often used interchangeably, it is more useful to preserve a distinction between them.

Performance measures refer collectively to several kinds of measures that reflect the performance of the organization. These include: inputs or resources used; processes or measures reflecting internal operations; productivity or the ratio of outputs to inputs; outputs, that is, the extensiveness and effectiveness of services delivered; and outcomes, the most difficult to measure, the effects of the services provided on clients and society. This article is primarily concerned with output measures in libraries.

THE TREND TOWARD MEASUREMENT

The growing use of performance and output measures for libraries is a result of several interrelated developments:

—The appearance of library researchers and, more recently, librarians

with interest and skills in quantitative methods which they used to address major library issues and management questions, for example, Goldhor (1972).

- The increasing size and complexity of libraries which has caused managers to seek new tools to help with decision-making.
- The discovery of libraries by nonlibrary researchers, particularly operations researchers and economists who found libraries to be complex organizations with interesting problems that were underutilized as research sites. Examples include Morse (1968), Hamburg et al. (1974), Leimkuhler (1972), Baumol and Marcus (1973), and Getz (1980).
- Growing demand for accountability in the public sector coupled with increased sophistication among librarians and other managers. As quantitative methods, program evaluation, and evaluation research have spread through the public sector, and accountability requirements have tightened, librarians have adopted these methods to remain competitive with other organizations seeking the same resources.
- The availability of grant funds from sources like the Library Services and Construction Act. Funders often require that projects include an evaluation component.
- An emphasis on formal planning. In public libraries, input-oriented standards have been replaced by planning processes: first Palmour et al. (1980) and more recently McClure et al. (1987). In academic libraries, the Association of Research Libraries introduced MRAP, the Management Review and Analysis Program, in the early 1970s. Planning requires setting of goals and objectives and assessing the library's current needs and progress for which objective data are useful.
- The appearance of a number of publications aimed at helping library managers to use measurement methods and results. These include Kantor (1984), Lancaster (1977), Lancaster (1988), Van House et al. (1987), and Zweizig & Rodger (1982).

Of course, managers have always used data for decision-making. And data do not replace managerial judgment. Managers, both librarians and others, vary in the extent to which they use performance measures in their decision-making. What has distinguished recent developments in libraries has been an increasing sophistication of the measures and methods used, a greater reliance on data in decision-making; and a reliance on output measures in particular.

It is beyond the scope of this article to comprehensively review the use of measurement data of all sorts in libraries. However, a review of some major landmarks in the use of measurement data leading to the present use of output measures will help to show the development.

EARLY APPLICATIONS

An early landmark in the discussion surrounding output measures

in libraries was Orr's (1973) framework. He described the assumed relationships among resources, capability, utilization, and beneficial effects of library services, in which an increase in one is expected to lead to an increase in each of the succeeding measures though not necessarily proportionately. Quality of service is a function of resources, capability, and utilization; value is a function of the library's beneficial effects.

Hamburg et al. (1974) attempted to develop an overall measure of library effectiveness. A group of faculty and students at the University of Pennsylvania's Wharton School set out to develop a system of statistical information for effective management of libraries and for decision-making about libraries. Objective evaluation of library performance requires concrete, measurable objectives. They concluded that the goal of libraries of all kinds is exposure of individuals to documents of recorded human experience. They then proposed a global measure of library outputs based solely on document exposure. Each service transaction was translated into exposure time.

This approach had methodological and conceptual problems (the most serious of which is the assumption that longer is always better), but it was significant in promoting service- and measurement-oriented evaluation and resource allocation. The message was that library evaluation should be based on library goals—i.e., on the services delivered. In relating the exposure hours delivered by a library to its operating costs, they suggested a way to justify library budgets and to compare library services for resource allocation.

Rzasa and Baker (1972) suggested an overall measure of academic library performance based on the number of users, materials used, reference questions, users studying their own materials, and total potential users in the library's population. The weights of each of these factors would be assigned by library management, and the overall results summed to a single figure of library performance.

These two approaches reveal the basic weakness of any attempt to develop a single measure of library output—the library provides a multitude of services to a variety of different types of users. Any attempt to consolidate measures of these individual services into a single index requires an ultimately arbitrary (and/or political) decision about the relative values of different services and types of users.

OUTPUT MEASURES IN PUBLIC LIBRARIES

Public libraries have played an important ongoing role in the development of output measures. DeProspero et al. (1973) developed a set of measures of public library services. Unlike Hamburg, they did not try to translate all services into a common unit of measure. They designed their measures to be do-it-yourself and even published a companion workbook (Altman et al., 1976). Their approach was significant in promoting the idea that managers, not researchers, could carry out the data collection and use the data for decision-making, and for developing

a set of distinct measures covering major library services. The first edition of *Output Measures for Public Libraries* (Zweizig & Rodger, 1982) followed DeProspero in presenting a set of measures covering common library services in an easy-to-follow manual. The second edition (Van House et al., 1987) retained the do-it-yourself approach and added more guidance on collecting data and interpreting the results.

The Public Library Association's sponsorship and promotion of the two editions of *Output Measures for Public Libraries* and their wide use in the public library community indicate, first, the value that public librarians place on output measures, and second, the readiness of the public library community to use measures that are presented simply and clearly.

OUTPUT MEASURES IN ACADEMIC AND RESEARCH LIBRARIES

In academic libraries, measurement has been used more often to study a specific service or resource, especially the collection. Academic libraries have been a favorite site for researchers, many of whom are academic librarians themselves. The pressures on many academic librarians to publish has no doubt added to the number of published evaluations of academic library services.

Kantor's (1984) manual presented a self-study approach to measurement, with forms and detailed directions, for academic and research libraries. It is concerned specifically with availability and accessibility of materials and delays in interlibrary loan delivery.

Several years' investigation into output measures for academic and research libraries by the Association of College and Research Libraries and its Committee on Performance Measures, Ad Hoc, has resulted in a manual that is currently being prepared by Nancy Van House, Beth Weil, and Charles McClure (in press). The manual will present a set of measures reflecting performance on major library services—document provision, information services, and facilities. The expected publication date is summer 1990.

In the United Kingdom, the Standing Conference of National and University Libraries (SCONUL) and the Library Association have collaborated on the development of measures intended to assess the adequacy of university library funding. The first phase of the project was concerned with the development of cost data. The second phase is concerned with measuring outputs to track expenditures. The emphasis is on quantities of services provided and internal processes (Loveday, 1988).

MEASURES OF SPECIFIC SERVICES

In contrast to these approaches to a single measure or set of measures of the full scope (or at least a significant portion) of library activities, numerous measures of specific library services have been developed. A comprehensive review would require a book such as

Lancaster's (1977) (currently being updated). What follows is an overview of some common approaches to the development of output measures for some major library services.

Collections

A major library service is the provision of documents. Evaluation of document provision has three dimensions. Collection evaluation is concerned with adequacy of the collection. Materials availability studies address the extent to which users find what they are looking for. Document delivery studies measure how quickly users obtain materials whether from the collection or elsewhere. The last two approaches often overlap since both are concerned with access to and use of materials.

Collection evaluation is generally considered separately from materials availability and document delivery. In academic and research libraries in particular, collection evaluation depends not only on use (Lancaster, 1982) but on other factors as well since a research collection exists for archival purposes which are not easily captured by output measures. Major approaches to collection evaluation are both quantitative (size, rate of growth) and qualitative (including expert judgment and bibliographies). These are summarized by Lancaster (1988). Both the Association of Research Libraries and the Research Libraries Group have been concerned with the development of methods for describing and evaluating research collections.

Evaluation of collections by their use and accessibility falls within the scope of output measures. The simplest approach is to measure use by counting the number of items circulated, possibly including those used within the library. Other output measures include:

- the proportion of the collection that circulates (e.g., Kent et al., 1979);
- the relative use of each part of the collection (e.g., Kantor, 1978);
- the proportion of user searches that are successful (Buckland, 1975; Kantor, 1984; Van House et al., 1987);
- the proportion of searches that are successful at each step in the search process (which allows a diagnosis of the causes of search failures [Kantor, 1984]);
- potential availability based not on actual user searches but on proxies such as references in user publications (Orr et al., 1968) or samples of published materials (DeProspero, et al., 1973); and
- the time required for users to get materials not immediately available, based on actual patron searches (Buckland, 1975) or proxies (Orr et al., 1968).

Studies of the determinants of collection use (e.g., Goldhor, 1972; Goldhor, 1981) go beyond output measurement to the investigation of the determinants of output measures.

Reference Services

Reference evaluation has assessed both quantity and quality. (Mea-

asures of reference effectiveness have been summarized in reviews by Powell [1984], and Lancaster [1988]). Measures of reference quantity focus on the enumeration and classification of questions answered (e.g., Goldhor, 1987).

Reference quality is much more difficult to assess. Measures that have been used include:

- the proportion of questions answered correctly as judged by the librarian (e.g., Kantor, 1981; Van House et al., 1987);
- the proportion of questions answered correctly in a simulation, as judged by an objective observer, with librarians knowing that they are being tested (Lancaster, 1988);
- the proportion of actual user questions answered correctly, as judged by an expert observer, after the fact, with the librarian not knowing at the time of the transaction about the evaluation (Van House & Childers, 1984);
- the proportion of questions answered correctly in a simulation, with librarians not knowing they are being tested—that is, unobtrusive studies (Hernon & McClure, 1987);
- the speed with which questions are answered;
- patron satisfaction with the answers and services provided (Goldhor, 1979; Weech & Goldhor, 1984); and
- the availability of reference staff.

Another area in which there has been much interest but less activity is the evaluation of literature searching services (Lancaster, 1988).

A major issue in reference evaluation is whether the reference librarian is aware that the evaluation is taking place or not—i.e., whether the study is obtrusive or unobtrusive. Weech and Goldhor (1982) compared the two approaches in five public libraries. Using questions of a comparable degree of difficulty, they found significantly better performance on the obtrusive test, suggesting, not surprisingly, that the obtrusiveness of the test affects the results.

Other aspects of the reference transaction that have been studied, such as the characteristics of users and their frequency and reasons for use, or attempts to explain the causes of differences in levels of reference performance, fall outside the scope of this article. They are, however, reviewed by Lancaster (1988).

Facilities

A library service somewhat neglected in output measurement has been the provision of equipment and facilities. In academic and research libraries in particular, the library is a major provider of study space and copy machines. Libraries also provide other selected facilities and equipment such as computers.

DeProspo et al. (1973) presented a method for measuring the intensity of use of public library facilities. The other major facility of interest

has been the catalog, as libraries switching to online catalogs have had to determine the number of terminals needed (Tolle et al., 1983).

ISSUES

Over the course of the development and use of such a wide array of output measures in libraries of all types and sizes, several key issues have emerged. Several conceptual issues relate to the definition of library effectiveness, to who judges effectiveness, and to the definition of information needs and uses. Methodological issues relate to the data collection methods, sampling, and statistics. Management issues address the appropriate use and interpretation of measurement data.

The Definition of Library Effectiveness

Output measures are intended to reflect the library's effectiveness in providing services. However, to measure effectiveness, one must first define it. For example, Hamburg et al. (1974) identified a single overarching library goal—exposure hour—and defined effectiveness as goal achievement. So their measure of effectiveness was the number of exposure hours produced.

The larger issue of organizational effectiveness has been called "the Holy Grail of management research" (Mohr, 1982) because of its elusiveness. At least four major definitions of organizational effectiveness have been proposed (Childers & Van House, 1989), each of which has different implications for the measurement of effectiveness. Researchers on library effectiveness have, for the most part, bypassed the fundamental question of defining library effectiveness (Childers & Van House, 1989) and have treated effectiveness as synonymous with goal attainment (e.g., McClure et al., 1987) which is only one of the four major approaches. Others stress the importance of measures of internal operations (process model), of relationships with the environment and acquisition of resources (open systems model), and of the satisfaction of key constituencies (multiple constituency model).

The multiplicity of library effectiveness measures that have been used suggests that a single, operational definition of library effectiveness probably does not exist, but rather that effectiveness is a multidimensional construct (Childers & Van House, 1989). However, addressing, if not answering, the fundamental question of the definition of library effectiveness is essential to further developments in this area.

Whose Perspective?

A related question is, from whose perspective is effectiveness measured? Different organizational participants may well have different goals for the library or may use different models of effectiveness. The result may be, at the very least, differences in the values expected on each measure. More fundamentally, different groups may use different mea-

asures to evaluate the library (Childers & Van House, 1989). *Output Measures for Public Libraries* calls its measures user-oriented, but they were chosen by librarians. Measures of reference success most often rely on the judgment of the librarian (Kantor, 1981; Van House et al., 1987) although users, not surprisingly, often judge the same transaction differently (Whitlatch, 1987).

Information Needs and Uses

Another issue relates to the fluid nature of information needs and library use. Many output measures are concerned with the user's success in meeting his/her need, be it for a document or for information. The measure is the proportion of searches that are successful or of needs that are met. But operationalizing this concept requires that the users have a discreet need that can ultimately be classified as being met fully, partially, or not at all. In practice, users' information search behavior is rarely so simple or so linear. Needs may appear, disappear, and change, all within the span of a single library transaction (Dervin & Nilan, 1986).

Measurement, Sampling, and Statistics

Most librarians have little or no training in statistics. Most output measures rely on sampling, but sampling and data analysis must be kept simple for do-it-yourself output measures. This simplification has its price in the precision of the data and sophistication of the analysis.

Library activities are difficult to sample because most vary over time—school and academic libraries follow the cycles of the academic day, week, and year; public libraries see seasonal variations in people's information needs and time allocation. Any short-term sample runs the risk of being representative only of that slice of the year. Longer term, more complex sampling schemes are difficult to design and to manage amidst other demands of operating an active library.

Sampling gives rise to sampling error. The second edition of *Output Measures for Public Libraries* (Van House et al., 1987) added a discussion of sampling error because libraries were concerned about performance differences that amounted to less than the sampling errors for the data being compared. As a practical matter, most libraries are limited to small samples with large sampling errors. Managers are often unfamiliar with the concept of sampling error or unclear of its implications for their decision-making.

User Surveys

Many output measures depend on user reports and/or evaluations—for example, materials availability measures that rely on actual user searches. User surveys are difficult to design and administer. They require not only a high level of effort but an understanding of the methods and pitfalls of survey research. A more insidious problem may

be surveys that try to impose library categories on user behavior inappropriately (Dervin & Nilan, 1986) thereby asking questions that users find difficult to answer or that do not accurately depict the behavior under study.

INTERPRETING AND USING OUTPUT MEASURES

Two key management questions in the use of any output measure are, exactly what is being measured? And what can the library do to improve its performance?

Determinants of Output Measures

Library services are a coproduction of the library and user. The user contributes to the production of his/her library services in at least two ways: (1) much library use is self-service; and (2) when the user asks staff for assistance, the user must communicate his/her need and then understand and use the staff member's response.

D'Elia (1988) has argued that the materials availability measures of the first and second editions of *Output Measures for Public Libraries* (Zweizig & Rodger, 1982; Van House et al., 1987) are invalid as measures of library performance because the user adds an immeasurable component. Materials availability measures reflect instead user success in the library.

More generally, libraries are complex organizations embedded in an even more complex and changeable environment. Output measures are affected by library and user actions and characteristics and by the external environment. The use of output measures to diagnose library performance and assess the outcomes of library actions is complicated by the complexities of the real world. While we may be able to construct abstract models of the relationship between library actions and output measures, in practice the complexity of the library and its environment interferes with attempts to understand and manipulate output measures. So far, researchers and library managers have been unable to identify, let alone control, all the variables that enter into the determination of output measures. This does not mean that output measures should be abandoned, but they should be used with caution and an understanding of their limitations.

These two questions—the validity of output measures as indicators of library performance and the identification of their determinants—require further investigation. In the meantime, managers must understand that knowledge of output measures and especially the factors that influence them is incomplete.

Cross-Library Comparisons

To be useful for decision-making, a measure must yield comparable results with repeated applications. Reliability within a library over time can be ensured by consistency in data collection and analysis. A

major reason for the detailed instructions in the output measures manuals (e.g., Kantor, 1984; Van House et al., 1987) is to ensure accurate and repeatable results. However, no manual can account for all possible circumstances. Many local differences in services and operations result in incommensurable results. Comparisons of output measures data across libraries, therefore, are generally much less credible than comparisons within a library over time. The universal tendency, however, is to compare—how else does a library decide what is an acceptable level of performance?

Output Measures, Funding, and Standards

Output measures have been used or proposed as the basis for standards and for state aid to public libraries. Input-based standards are insensitive to the kinds and quality of resources and the uses to which they are put. Standards based on output measures are intuitively appealing. However, until more is known about output measures and their determinants, such a move is perhaps premature.

- Unless the set of measures used covers all dimensions of library effectiveness, basing standards or funding on output measures may skew library performance in favor of measurable activities. In particular, quantity is much easier to measure than quality.
- Until the determinants of output measures, especially those not under the library's control, are better understood, such uses of output measures run the risk of inappropriately rewarding or penalizing libraries for factors not under their control.
- Until the determinants of output measures are better understood, basing standards or funding on output measures may subject libraries to impossible demands. They may be ordered to improve their performance on certain measures even though no one can tell them how.
- Cross-library comparisons are valid only if the measures are applied uniformly. Absolutely comparable data would require impossibly detailed instructions which still could not ensure complete comparability. And such uniformity would probably not be as useful for internal management as letting people make their own choices about measures and measurement within certain broad parameters.

CONCLUSION

The increasing use of output measures and other kinds of performance measures in libraries has been an exciting and valuable trend. The continued development of measures, and their growing use by library managers, promises to improve the understanding and management of library services.

Much remains to be learned about output measures and their determinants, however, before there is a full understanding of what the measures are saying about library services and, more importantly, what a library can do to improve its performance. Continued methodological

development is also needed to ensure that the measures used are valid, reliable, precise, and practical.

The library field has been notable for its isolation in considering the common problem of organizational effectiveness. It should draw on research in related areas such as research on organizational effectiveness and program and service evaluation in related fields, especially in the management of the public sector and of service organizations (e.g., Cameron & Whetten, 1983). For example, Childers and Van House (1989) have drawn on the work of Cameron in higher education (Cameron, 1978; Cameron, 1981; Cameron, 1986).

In output measures in other areas, continued dialogue between managers and researchers is essential. Managers need the help of researchers in developing reliable, valid, and precise measures. Researchers need the help of managers in defining library effectiveness and mapping the boundaries of the construct.

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Increasing the Usefulness of Research for Library Managers: Propositions, Issues, and Strategies

CHARLES R. McCLURE

ABSTRACT

THIS ARTICLE DISCUSSES THE importance of research for library management. As a means to increase the impact of research, a number of propositions are suggested. These propositions identify possible strategies for both researchers and library managers to better create and use research. Conceptual and practical issues also are discussed that affect the utilization of library research, and the article concludes by stressing that the utilization of research will improve only with a conscious effort on the part of *both* library managers and library/information science researchers.

INTRODUCTION

In a 1962 paper, Herbert Goldhor (1962) commented that "research can improve the precision and practical utility of even the best projects and practices," but he noted also that "some will no doubt feel that research methods are unable to grapple with the problems of librarianship" (p. 46). In a similar vein, Ernest R. DeProspero (1972, p. 1) concluded that "much of the research effort in librarianship whose objective has been to influence library policy has been ineffectual" (p. 1). More recently, in a 1988 study of the status of research in library/information science, the authors concluded that researchers and library decision-makers have yet to communicate effectively with each other (McClure, 1989).

With the passing of more than a quarter of a century since Goldhor's assessment, significant progress and increased sophistication have occurred in the development and application of research methods in

librarianship. Yet the degree to which research has, in fact, improved library practice is less clear. Goldhor's concern of 1962 that librarians believe that research is unable to grapple with the problems of librarianship is still very much with us in 1989.

Although some research can be characterized as basic and is not intended to produce useful findings or impact, much of the research in library and information science is applied or action research and is intended to directly affect practice. Thus a key concern is the degree of impact this research has had on library management. Library researchers would like to think that their studies have had an impact and cannot understand why library decision-makers ignore all that "good research" in the professional literature. And library decision-makers repeatedly dismiss that literature and ask researchers to deal with more meaningful topics and produce results with direct applications for *their* library. As a result, applied research frequently is short-circuited.

The perspectives offered in this article are based largely on the author's personal experiences in conducting a number of research projects in recent years. Readers interested in recent background literature on the general topic of research in librarianship may wish to consult works by Lynch (1984), Kutzer (1987), and McClure and Bishop (1989). Rather than review the findings and opinions noted in those works, this article considers the impact of research largely in terms of:

- producing relevant management data actually used for improved library decision-making;
- affecting the day-to-day process or activities by which decision-making occurs in a specific library, or
- changing attitudes toward basing decisions on empirical evidence as opposed to what some have called "seat-of-the-pants" management.

All of these facets of impact relate to Goldhor's assertion that research can improve library practice.

This article considers the role of research in assisting library managers to operate libraries more effectively. More specifically, it offers some propositions that appear to increase the impact of library research, identifies key issues related to the impact of research, and offers some preliminary perspectives about how the profession, as a whole, might better produce and utilize research for library decision-making. The article explores these key issues:

- Why are library researchers and library decision-makers unable to communicate effectively with each other about the production of management data useful for library decision-making?
- What factors tend to encourage high impact of research studies on library decision-making?
- How can both researchers and library managers better work together to produce and utilize research?

A discussion of these issues may assist the profession in moving toward a realization of Goldhor's vision.

CLARIFYING THE INTENTS AND TYPES OF RESEARCH

In the rush to cloak librarianship in credibility and respectability, the profession adopted many of the approaches and notions of scientific inquiry based on philosophies and procedures of the hard sciences. However, library and information science—as do many professions linked to the social sciences—frequently finds the expectations and requirements of research as defined by the hard sciences model to be unattainable or inappropriate. Reasons for this situation are numerous, but the nature of library/information science phenomena, emphasis on applied research, and the tension between a very large population of practitioners and a very small population of researchers are key concerns (McClure and Bishop [1989] suggest an estimated population of 300 or so active researchers and about 153,000 practitioners).

Basic Versus Applied Research

There are different types of research—each serving different objectives. Traditionally, the hard sciences model suggests that there is “basic” research and “applied” research. Until recently, conventional wisdom believed in the “trickle down effect,” that is, basic research was absolutely essential for applied research to occur. That perspective, however, is now under attack (Shapley & Roy, 1985).

There is, however, little basic research conducted in library/information science. As a field, it draws, primarily, upon a broad range of interdisciplinary social and behavioral science foundations which serve as both a philosophical and methodological basis for the applied research that is conducted.

Applied research takes the theory and concepts from basic research and, by formal methods of inquiry, investigates “real world” phenomena. Action and policy research, which can be considered as types of applied research, specifically attempt to identify problems in an organizational setting and—through a formal means of investigation—suggest strategies to deal with those problems (a description of the action research process can be found in Swisher and McClure [1984]). Development (which may not, in fact, be classified as a research process), is the application of existing findings and information to a workable process or product for a specific setting.

It is also important to note that basic and applied research are generally intended to have broad *external* validity (generalizability) whereas most action research and development are intended to have *internal* validity (the findings are accurate for one particular setting only). Increasingly, however, some researchers are suggesting that external validity for social and behavioral science research is unattainable. There simply are too many possible variables that may affect human

behavior in any given situation—thus predictability in the social sciences for a broad population may be an unrealistic goal (Guba & Lincoln, 1985).

Clearly the lines that separate these types of research are fuzzy at best. But, for library and information science, an interdisciplinary base of existing social and behavioral sciences may substitute for the “basic research” which is available in the physical sciences. There is little disagreement that, as a profession, library and information science fosters little research that is intended to produce “knowledge for the sake of knowledge.”

One might also argue that much of the research conducted in library and information science, while not basic, has no intent of assisting library management to improve overall library effectiveness. Rather, it might have been done to provide a historical perspective on some current issue, determine the validity and reliability of a new data collection instrument, propose propositions for further investigation, or test a specific hypothesis.

In short, there are different types of research each with different objectives. Some of that research has no intent to affect library practice and thus cannot be assessed against that criterion. But for research that is intended to improve library practice, there is still a significant communication and implementation gap.

Divergent Views on Conducting and Using Research

Many library researchers tend to concern themselves with applied research, investigating questions which stem largely from the social and behavioral sciences. But discussions about basic versus applied research are often false dichotomies since library decision-makers require action research and development projects if “impact” on decision-making is to occur. Two key factors help to explain this divergence of views toward conducting and using research.

The first factor is educational background. Researchers must complete an educational process that requires them to identify a significant original problem and conduct a research study which is acceptable to the norms of the academy. This process is built largely on inquiry methods developed under the auspices of the “scientific method” in the physical and natural sciences. The problem to be studied may or may not have anything to do with library practice.

Thus, with their doctoral degree programs, the schools have produced individuals who are competent in conducting research which is best described as investigating a rather narrowly defined problem which lends itself to research, basing that inquiry on social and behavioral sciences’ conceptual frameworks, demonstrating some analytical rigor, and, if possible, demonstrating an ability to analyze (quantitatively) original data. While a library may serve as a source for “data,” it is also possible that no direct contact with a library or related information

agency occurred during the research. It is hoped that the study results in a contribution to the conceptual underpinnings of the profession and has a broad degree of generalizability.

Library decision-makers frequently find themselves in managerial positions with maybe one formal course in library administration and no formal training in conducting or understanding research. Thus, with good reason, they are not familiar with a broad range of managerial techniques nor the "science" of managerial decision-making. Further, they lack the knowledge to conduct research on-site in the organization and in many instances are unable to intelligently "consume" the research that appears in the professional literature. But even if they could consume this research, they would find that the authors typically fail, as C. West Churchman (1964) has noted, "to transform the available information into a knowledge of action" (p. 33).

A second factor to be considered is reward structures. Because library researchers typically exist in an academic setting, they, with good reason, direct their behavior to activities that will be rewarded by promotion and tenure. The traditional triad here is research, teaching, and service—of which research typically is most important. Because of the educational background and the desire to maintain status and credibility in the university, after the awarding of the doctorate, researchers typically continue to produce applied research—if they produce any research at all (for a summary of recent findings on this subject, refer to Table 1 of McClure & Bishop, 1989).

The reward structure for library decision-makers also inhibits application of research in the decision-making process. Once on the job, these decision-makers find themselves operating under severe resource constraints with little time available for developing innovative managerial strategies or conducting research. Typically there are few rewards for those who do return to formal educational opportunities to obtain greater knowledge of either management or the research process. Interestingly, while other types of librarians—e.g., school and medical—have recertification procedures that require regular educational updates, such is not the case for academic and public librarians.

Thus library researchers and library decision-makers are of "two cultures" when it comes to training related to the research process. Much library research fails to fulfill a utility criterion for the on-the-job harried decision-maker. Frequently, even if the research was intended to produce data for use in library management, it fails to offer specific managerial strategies to act upon the research results. Further, researchers and library decision-makers operate under two entirely different reward structures. One largely ignoring contributions that a researcher might make to improve the practice of librarianship, and the other ignoring contributions that the librarian might make by conducting and utilizing research.

In general, then, library researchers are trained to produce applied

research with some generalizability. The research should be suitable for publication in refereed journals and it should advance knowledge. Library managers require action research that has high internal validity for their particular library setting. The research must be uncomplicated, specify implementation strategies, and solve problems. Clearly, these are two differing perspectives.

INCREASING IMPACT: A PRELIMINARY SET OF PROPOSITIONS

Increasing the impact of research on practice has been widely discussed in the literature of various professions. A useful discussion by Rothman (1980) offers a concise summary of specific strategies to increase impact, both for researchers and practitioners (pp. 172-75). In light of Rothman's list of suggestions, the earlier discussion of the competing two cultures between researchers and practitioners, and this author's personal experience in a number of recent research projects (see Appendix A), the following propositions are offered regarding research and the degree to which it is likely to have impact on library practice.

Research NOT initiated or at least agreed upon by those libraries or librarians most affected is unlikely to have much impact. Library decision-makers must first believe there is a problem to be solved before they are likely to be interested in research findings. In addition, those librarians who initiate a study or at least agree that a particular study is needed have made an initial and important commitment to implementing study results. It is very difficult to sell research findings to the profession without such initial interest and commitment.

The greater the interaction between the researcher and the primary stakeholders during the research project, the better the impact of the research for decision-making. Continuous interaction between researcher and library decision-maker encourages the production of a study that is relevant to both parties. Evaluation at the early stages of the study can help fine tune the study as it proceeds. Without such communication, the study can drift away from subjects of direct interest to the library and result in a report that relies too much on research jargon and fails to offer specific recommendations for implementing study results. When the researcher and the stakeholder communicate with each other during a project, reality therapy keeps the project on track.

Research results which do not include carefully designed, practical, step-by-step guidelines, for implementing results in a specific context are likely to have less impact. Frequently, researchers confuse identifying and providing information that describes the problem with developing specific strategies to do something about that problem. Simply identifying managerial problems and offering polemics about the situation is inadequate. Findings must be presented in clearly understood language and in a practical step-by-step approach for implementation.

However, the production of such practical manuals are less rewarding for researchers striving for promotion and tenure.

The greater the effort researchers make to produce broadly generalizable findings, the less likely the research will have an impact on practice in a particular library. Every library has unique organizational, political, and resource configurations that make "generalized" findings from traditional library/information science research very difficult to implement in that particular setting. However, most social science researchers are taught to conduct studies that stress generalizability rather than internal validity for a particular organizational setting. Unfortunately, generalizable findings are very difficult to implement in a specific setting.

Research designs and implementation strategies must consider politics and personality characteristics in individual organizational settings for impact to occur. The increasing complexity and uniqueness of library political settings and personalities requires study designs that take these factors into consideration. Study designs that have greater potential to assist in local library decision-making—e.g., case studies—typically are not highly regarded by the body politic of library and information science researchers. Yet it is these studies that have a better chance of choosing personality traits and politics as variables since they are two crucial factors that affect implementation of research findings. But the greater the attention paid to these variables in the context of factors for a particular organization, the less generalizable the results and thus, the less likely the research will be well-received by the academy.

The more practical library experience a researcher has or the greater the research skills and knowledge of the library director, the better the impact of a research study on library practice. The issue here is the need to bridge the gap between the two cultures of the researcher and the practitioner. Library and information science currently lacks sufficient numbers of researchers who can serve as a bridge between the two cultures. Applied or action research directed either by a researcher with practical library experience or by a librarian with well-honed research skills is likely to have a greater impact on practice since it is likely to exhibit increased awareness and understanding of both perspectives.

For research efforts to influence library decision-making or have an impact on library management, long time lines and specific attention to implementation are required. Generally, researchers cannot afford to pursue a topic over a long period of time. First, funding agencies do not have a history of supporting multiyear projects; they want a project designed and completed in a short period of time. The next year their priorities might change and it may be impossible for researchers to obtain additional funding to carry on that particular line of research. In addition, few funding sources provide for effective dissemination/im-

plementation support. The results are short time lines for the research, limited visibility, and little attention to implementing the results.

The degree to which a key stakeholder funds the project or commits other direct resources to the research project tends to encourage greater impact of study findings. Allocation of library resources to a research study encourages use of study results. There are numerous types of resources that the library might commit to the project—e.g., staff, material, equipment, facilities, data, etc. However, there are few models of “partnerships” in research where it is expected that the library will provide direct resources in support of a project. The price for such resource commitment, however, may be increased library control over the project. If researchers want to have significant impact on day-to-day decision-making in a library, they must have a library “partner” that has committed resources to the project.

When researchers serve as consultants, they greatly increase the likelihood that research findings will have an impact on library decision-making. Contrary to popular belief, important action research is conducted as part of consulting. The consulting model of interaction between a researcher and a client offers a powerful approach for increasing the usefulness of research. However, consulting is not likely to provide much support for a researcher’s promotion and tenure file unless it results in refereed journal articles and other types of publications.

In summary, if there is some validity to these propositions, research intended to be useful for library management should be initiated and supported by the primary users of such research; designed to encourage ongoing communication during the project between the researcher and the key stakeholders; be translated into practical procedures that can be easily understood; and take into consideration specific organizational constraints, personalities, and political agendas unique to that particular library.

Despite the best efforts to design studies with these propositions in mind, factors within the library also affect the impact of research on library decision-making. Clearly, numerous constraints can mitigate the use of *any* research regardless of its quality and the degree to which it is carefully crafted—for example:

- limited staff time and other resources;
- competency of staff to utilize research findings;
- attitude of the staff toward research and the research process;
- inability of library managers to accept findings which require change from the status quo;
- management style and philosophy of library managers; and
- limited reward structures that discourage change and use of research findings.

Depending on the library, such factors can be serious impediments to the impact of *any* research.

In addition, researchers must have a clear understanding of the context in which most library managers operate. Ackoff (cited in Schon, 1983) described this context as follows:

managers are not confronted with problems that are independent of each other, but with dynamic situations that consist of complex systems of changing problems that interact with each other. I call such situations messes. Problems are abstractions extracted from messes by analysis....Managers do not solve problems, they manage messes. (p. 16)

The techniques that many researchers learned as basic research skills—e.g., isolating only on a particular variable or small set of variables—simply do not lend themselves to producing research findings that help managers manage messes.

A FRAMEWORK FOR STRATEGIES

Given the problems identified thus far, the earlier listed propositions, and Ackoff's admonition, it is clear that any discussion of increasing the impact from library research is a complicated one at best. In considering this topic, there are both conceptual and practical issues that need to be examined.

Conceptual Issues

A recent paper by William Paisley (1985) notes that a much larger concept of information literacy is needed: "The future environments will provide extraordinary access to information but only to those who understand the algorithms of information seeking" (p. 73). He goes on to point out that what is needed is "processed information" (information analyzed and related specifically to an information need) as opposed to "object information" (descriptive information of things and events). This suggests that research findings couched in terms of "processed information" are likely to have much greater impact than those presented as "object information."

Paisley's comments point to the need for a different model for both seeking and using information—especially in the context of decision-making. Library managers may need to articulate better the "messes" or problems with which they are confronted. For their part, library researchers may need to do a better job of producing "processed information" that addresses these problems.

Donald A. Schon (1987) has offered such a model in his book *Educating the Reflective Practitioner*. This book describes how the professions can apply research techniques and educate new professionals. His approach is certain to be controversial because it challenges a number of long-held norms about the roles and relationships between the researcher/instructor and the practitioner.

Schon has proposed that there is a tacit knowledge, composed of a

"knowledge in action" and a "reflective knowledge," that practitioners use as a basis for decision-making on a daily basis. He uses as an example the difficulty one might have in explaining how to ride a bike. While most know how to do this, it is very difficult to describe the decisions one must make to complete this activity successfully.

Perhaps the profession needs to rethink the traditional models of scientific inquiry in order to form better links between research studies and cognitive processes used by professionals during the decision-making process. Perhaps we need to draw upon the models of clinical education (Schien, 1987) and medical internships to keep communication lines open between researchers and library managers. Generally, library researchers appear to have a different model (a very rational one) for how decisions are made in "the real world" which differs significantly from the model proposed by Schon and the actual behaviors of library managers.

The conceptual context for applied research in librarianship does not appear to recognize the importance of "processed information" and "tacit knowledge." The typical failure of researchers to consider factors related to the politics, personalities, and policy-making process within specific organizational contexts may be a reflection of this unbalanced conceptual context. There is a pervasiveness of politics in every organization and most applied research considers only the technical information—e.g., techniques of production, descriptions of activities, and assessments of observable phenomenon.

In terms of affecting decision-making, this is only half, or less, of the picture. The information that is likely to be more important is political information—e.g., "information that reveals the intentions and capabilities of others so that one's own resources can be deployed more advantageously to advance one's own objectives" (Uphoff, 1972, p. 37). Yet it is the political and policy perspective that is oftentimes lacking in library/information science research.

These concerns suggest that those library researchers wishing to have an impact on library decision-making must be much more knowledgeable about public policy, the policy making process, and the political context within which power, position, and persuasion are used by key stakeholders. Research findings *must* be presented in this context if they are to have an impact on decision-making. The field of public policy is replete with models and practical suggestions by which researchers in library and information science could increase the probability that study results are better utilized by library managers. Some useful introductory texts on public policy and policy analysis are Gilbert (1984); Jones (1984); and Majchrzak (1984).

Furthermore, the traditional model of rational versus political decision-making fails to consider "gut-level" decision-making techniques. This model of decision-making relies on instinct, ideology, or a "feel" for a particular problem or issue. "It is useless to hope that people in power who rely largely on intuition for decision-making will someday succumb to the seductions of social science research" (Miller, 1989). Thus the message is clear for researchers wishing to have impact on library decision-makers—select your target audiences carefully.

Practical Issues

Given these larger conceptual issues, there are a number of very practical issues that must be squarely addressed if library and information science research is to have a greater impact on library decision-making.

First, researchers need to understand that, generally, library managers need data that is "good enough" as opposed to data that has been shown to be reliable at the 95 percent confidence interval (McClure et al., 1986). This reality also flies in the face of what is typically taught as "good" social science inquiry. Managers need "good enough" data and are under severe time constraints to act upon problems; spending an additional five months to investigate a problem to ensure *statistically* reliable and valid data simply is not possible.

Second, reward structures for researchers in most schools of library and information science place applied research, consulting, policy analysis, and related forms of inquiry (especially those that do not generate refereed papers) in low esteem. Thus the needs of the profession—i.e., workable solutions to problems—and the reward structure of the university are in considerable conflict.

Practitioners who constantly point to the perceived "uselessness" of much library research have yet to come to terms with this problem: the research may have little value to assist in decision-making, but it does meet the demands of the university for generation of new knowledge and, not unimportantly, promotion and tenure. And one must keep in mind that it is the university that pays most researchers—not the library.

Third, the professional education of librarians and library researchers is currently geared to increase conflict between the needs of library managers and the abilities of librarians and library researchers. At the doctoral level, library researchers, for the reasons given earlier, generally are not trained to produce research relevant for library decision-making. At the masters level, students are not trained to become informed consumers of research—they are unable to articulate aspects of managerial problems as research problems, and they shudder at the sight of a chi-square. As a result, many practicing librarians have little knowledge of the research process nor do they know how to read and understand the research literature. Thus they are unlikely to act upon the research reports they encounter.

Fourth, there is a critical need for library researchers and library managers to become directly involved together on specific research questions and daily managerial problems that might lend themselves to investigation. Except for the consulting process (which many libraries cannot afford and for which researchers are unable to receive adequate university rewards) there are few mechanisms in place that encourage this partnership in research to occur.

A range of specific strategies to improve research in library/infor-

mation science have been suggested recently by McClure and Bishop (1989). But strategies aimed specifically at increasing the likelihood of impact on library practice include:

- Design and establish a program of “visiting researcher” positions in a range of library settings. A number of libraries have used this technique both to instruct librarians in the research process and to help a library researcher better understand research needs within the library.
- Establish consortia that identify specific research problems that need attention, ask libraries to subscribe direct financial support to address this problem, and produce research reports specifically intended to aid in decision-making. The Library Research Center at the Graduate School of Library and Information Science at the University of Illinois has used this technique and the Public Library Development Project was also established by such means.
- Formalize practicums between researchers and library managers (rather than in the context of educating MLS students). Such practicums are essential for library researchers and library managers to better understand each other’s perspective. Such practicums can be designed to investigate specific research problems.
- Recognize serious deficiencies and limitations in the ability of most library schools to produce professional librarians who can both conduct and understand research, given only thirty-six credit hours (typically) of library and information science education.
- Work to expand reward structures in universities that recognize professional activities and action research applications. Like it or not, the reality that schools of library and information science are first and foremost *professional schools* cannot be ignored.
- Consider national programs for the recertification, on an ongoing and regular basis, of both librarians and library and information science educators to ensure ongoing continuing education and professional development.

There is, however, an inherent philosophical conflict between the researcher taking a distant and objective view of a particular problem as opposed to one in which the researcher becomes actively involved in not only the research but also in encouraging the implementation of the research findings. Miller (1989) suggests that researchers can increase their impact on decision-making by taking proactive stances by strategies such as:

- Whistle Blowing*: If a researcher is left with an important study and no client, it may be necessary to force it into the decision process through whistle blowing.
- Job Shuffling*: Actively seek clients who at least will tolerate curiosity about the problem and who are willing to consider a study on the topic.
- Becoming Your Own Client*: By spending more time in a governing

role, you can control the first critical policy decision—whether to commission some research to address the topic or let decisions be ruled exclusively by special interests or the gut.

—*Improving Your Product*: Produce a range of products that translate the research into usable strategies for decision-makers.

Some researchers would find such strategies too self-serving. And once again, however, there are few tangible rewards for researchers who engage in such strategies. Indeed, it is more likely that such researchers would be disavowed by other researchers for becoming “personally involved.”

These, of course, are only some of the issues, and they are offered from the perspective of a researcher looking for strategies to link research to decision-making and to cement relationships between library managers and library researchers. Library managers may have different suggestions to accomplish these objectives. However, both perspectives are necessary if we are to improve the applicability of library research for library decision-making.

CONSTRUCTING BRIDGES BETWEEN RESEARCHERS AND LIBRARY MANAGERS

In 1962, Goldhor lamented the fact that there was little published on “how to conduct research in librarianship, or even on how to apply statistical methods to the types of data most often found in library studies” (p. 45). In 1972 he attempted to correct that situation with the publication of *An Introduction to Scientific Research in Librarianship*. This classic work represents one of the first major efforts at producing a research methods textbook for librarians. Since the appearance of that text, a number of additional research methods textbooks have been published.

Although the knowledge and sophistication of library researchers may have grown significantly in the last few decades, their ability to communicate research findings to library managers has not. DeProspero's (1972) admonition to library researchers still holds true today: “The fact is that those who accept the label of “researcher” must be more willing than they have been to find better ways of selling their products [and] more willing to reduce the mystique of the research process” (p. 20). The propositions and strategies suggested in this article offer a beginning point in response to both Goldhor's and DeProspero's concerns for increasing the impact of research on library practice.

The ongoing issue, however, is to demonstrate, in fact, that research *does* improve overall library effectiveness. Throughout Goldhor's academic career, he consistently argued that, “most libraries which constantly gather data and study current progress are the ones whose planning and decisions put them out in front as leaders not blind followers. They like to know what they are doing and why” (Wheeler et al., 1962, pp. 130-31). Apparently, a number of library decision-makers

have yet to accept Goldhor's conclusion and the gap remains between conducting research and using that research to improve library practice.

As this article suggests, the gap between library managers' need for management data to help them resolve problems, and the research community's ability to meet this need must be bridged. Indeed, drawing battle lines that are "we-them" oriented will only widen the gulf between library managers and library researchers. Clearly the profession as a whole needs to expand the dialogue on this topic and develop specific strategies for increasing the impact of research on library practice. Such strategies are both possible and feasible. However, library decision-makers, researchers, professional associations, schools of library/information science, and funding agencies must all work *together* to accomplish such an objective.

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Herbert Goldhor—A Tribute and Bibliography

JAMES KRIKELAS AND CHARLES A. BUNGE

ABSTRACT

HERBERT GOLDHOR'S CONTRIBUTIONS to librarianship and library education are many and varied. These contributions are reflected in this comprehensive bibliography of his publications, numbering over 175 items. The essay that accompanies the bibliography provides a brief sketch of Goldhor's life and career and a discussion of two especially important aspects of his contributions: (1) public library service and administration (including the collection and publication of data for analysis and use by researchers and decision-makers); and (2) scientific research in librarianship.

INTRODUCTION

The American Library Association's 1988 Melvil Dewey Medal was awarded to Herbert Goldhor in recognition of his "creative professional achievement of a high order." The citation notes "his contribution to library education, his gathering and analysis of statistics, and his leadership in library administration and professional associations" (Avram, 1988). This award is fitting recognition for a career-long commitment to excellence that characterizes all of his efforts, whether performing service on a professional association committee, as consultant, administrator, author, teacher, or researcher. The following tribute by two of his former students is written on behalf of all those whom Herbert Goldhor has influenced and assisted in their own pursuit of excellence.

As the citation for the Melvil Dewey Medal indicates, the areas of Herbert Goldhor's contributions are many and varied. One thread that

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has run through these contributions has been his commitment to the use of the best and most complete information possible for decision-making in librarianship—both as a field of practice and also as a scholarly discipline. This commitment is evidenced, for example, by the myriad citations in his public library administration textbook, by his untiring work on gathering and publishing data on public libraries for analysis and use by researchers and decision-makers, and by his vigorous advocacy of carefully conducted research in pursuit of basic and generalizable knowledge. Those who reflect on what is distinctive about Goldhor as a teacher and as an educational administrator might agree that his contributions in these areas, too, reflect his commitment to truth, as scholars and teachers can discover and transmit it.

Goldhor's commitment to the discovery and use of the best possible information resulted in numerous publications which are all an important contribution to the field. The publications listed in the Appendix really speak for themselves. This article will briefly discuss two areas of his contributions: (1) public library service and administration (including the collection and publication of data for analysis and use by researchers and decision-makers); and (2) scientific research in librarianship. (Bracketed citations in the text refer to entries in the Appendix. The citations are arranged in chronological order [by year of publication] and alphabetically within each year by title.) A brief sketch of his life and career will serve as a prelude to the discussion.

PROFESSIONAL BACKGROUND

Herbert Goldhor was born in Newark, New Jersey in 1917. He received his B.A. from Dana College (now Newark College of Rutgers University) and a B.S. in Library Science from Columbia University in 1938. His first professional position was assistant to the librarian at Iowa State College (now university). His career interest, however, was clearly in public library administration as evidenced by the subject of his first published paper [1939]. For the next three years he studied at and earned his Ph.D. [1942b, 1943] from the University of Chicago's Graduate Library School. After service during World War II [1947d], he joined the Library School faculty of the University of Illinois at Urbana-Champaign where he remained for six years (1946-1951). While at Illinois he was the editor of the *Occasional Papers* series started in 1949 [1949g] and published the first of many trend-line indexes [1948b].

In 1952, Goldhor left the Library School to become the third chief librarian of the Evansville and Vanderburgh County (Indiana) Public Library [1962a]. During his tenure as librarian he continued to investigate and report on various aspects of public library administration, and during this period he established a new reporting service, *Public Library Abstracts*—an activity that continued for seven years [1960a]. Goldhor remained in Evansville until January 1962 and then returned to the University of Illinois as associate director of the Library School.

(The title is somewhat misrepresentative since the associate director actually served as the chief administrative officer of the school and, in fact, the title of the incumbent was to change to director the following year.)

In addition to administrative responsibilities, Goldhor also taught a number of courses. For doctoral students—during a fifteen year span—he was synonymous with the “research methods” requirement of the school. He found time to edit the *Occasional Papers* series for a second time, to serve as managing editor of *Library Trends*, to nurture the ongoing “Clinic on Library Applications of Data Processing” (serving as editor for three of the first four proceedings [1964b, 1965a, 1966b]), and to present various talks and articles that normally befall administrators [e.g., 1967c, 1968a]. During his first decade back at Illinois, Goldhor coauthored with Joseph Wheeler [1962c] a highly acclaimed text on public library administration and wrote his landmark textbook on research methods [1969b].

In 1975 Goldhor also became director of the school’s Library Research Center, a position he continued to occupy even after stepping down as director of the Graduate School of Library Science in 1978. A sabbatical during the following year (1978-79) permitted him to conduct a series of studies at the Kingston and St. Andrew Parish library in Jamaica, interrupted briefly by a visit—on behalf of Unesco—to review the Library School at the University of Brasilia [1980c, 1980d]. In 1987, Herbert Goldhor retired from the university, but he continues an active work schedule as evidenced by his continued productivity as researcher and scholar during 1988.

Herbert Goldhor is an active (life) member of the American Library Association as well as two statewide groups—the Illinois Library Association and the Indiana Library Association. He also was an active participant in the (then) Association of American Library Schools during his tenure as Director of the Graduate School of Library Science. He was honored as Librarian of the Year in 1987 by the Illinois Library Association. He received the Scarecrow Press Award for Library Literature for 1963 (with Joseph Wheeler) and, as noted, received the Melvil Dewey Medal in 1988. The brief review that follows has been organized around two interests which characterize Herbert Goldhor’s research and publications. Needless to say, this gives only a partial—and biased—view; partial because it does not deal with much of the human element of the man and biased because it separates into discrete parts the whole body of his work.

RESEARCH IN LIBRARIANSHIP

The diversity of what constitutes research in librarianship is only partially expressed by the titles and topics covered in this issue of *Library Trends*. There exists a broader spectrum of definitions and it is important to realize that not everyone uses the term in the same way nor

does everyone agree on the purpose for doing research. Suffice it to say that proponents of each school of thought exist and that librarianship is sufficiently diverse to accommodate each. One of the strongest advocates of the use of scientific methods is Herbert Goldhor.

Understanding his concept of scientific research can be accomplished by studying Goldhor's research reports and also his numerous reviews of research (in addition to over fifty book reviews, he has served as a referee/evaluator for numerous journals and agencies). Three other sources offer a more succinct overview of his idea of the nature and purpose of research in librarianship: two articles—separated by twenty-five years—and his classic text, *An Introduction to Scientific Research in Librarianship*, published in 1969 [1947b, 1962c, 1969b] (Navaes, Hagenberg, & DaMotta, 1973). An analysis of these writings will reveal some standard characteristics in terms of purpose and procedure. For Goldhor, research—specifically *scientific* research—is designed to investigate the relationship between two or more variables. If possible, such investigations should reveal the nature of that relationship (including determination that the relationship exists), identification of an explanation for such relationships (preferably in causal terms), and the limits of generalization (the universality of the findings). Even research that might be carried out by practitioners required these elements he noted: "To carry through a successful research study ... [one must] formulate a clear and direct hypothesis to guide the study. . . .devise procedures effective for collecting reliable and valid data. . . .[and] acquire a background of knowledge. . . .by which to interpret [the] data in a meaningful way" [1947b, p. 1677]. "In view of the results achieved," Goldhor wrote, the scientific method "is the easiest method to learn; once one has learned this method [one] can understand and use any of the less rigorous methods, but learning the latter will not prepare one really to use the former" [1969b, pp. 1-2]. In order to collect "reliable and valid" evidence to support (or refute) a hypothesis, the researcher may use any one (or more) of the standard methods such as historical, survey, descriptive, and experimental. One method cannot be considered superior to all others in any absolute sense. The method selected must be the one most appropriate to the problems to be solved. Goldhor himself used several different techniques.

The typical scientific approach is characterized not only by the process but also by a different attitude; seeking an explanation for some phenomenon is as important as realizing that some relationships do, or do not, exist. Thus in the analysis of data it is just as important to ask why as it is to seek meaningful relationships. An example of this attitude can be seen in Goldhor's comment on a study of readers in Evansville. A poll of 100 adult borrowers was completed annually over a four year period. Respondents were asked four questions: for whom was the book borrowed? how much of the book was read? did it satisfy need? and how was the book selected? Overall results tended to be similar year

to year with 10 percent indicating they did not read the book at all and another 10 percent stating they had not been satisfied. Fifty percent of the books were obtained by browsing while only 20 percent were selected with the help of the staff.

Twenty percent was discouraging until we did some cross-analysis. Of the 20% who had the help of a staff member, none failed to read the books, and almost none were disappointed in *their* books. From our limited data it seems that if a borrower wishes to get a book he will read and find helpful, he would be well advised to get help from a library staff member. [1962f, p. 3]

A third characteristic of scientific inquiry is to recognize that the search for generalization requires looking for limits. Thus replication of studies becomes very important. A number of Goldhor's studies have been replications in different settings or at different times for the same general investigation. In some cases, elements from various earlier studies are incorporated into subsequent studies giving some sense of the degree to which previous findings are generalizable. Most of these studies, of course, are set in public libraries and support not only the value of the method but provide substantial information that can assist the public library administrator.

THE PUBLIC LIBRARY: SERVICE AND ADMINISTRATION

Research in librarianship is often criticized for being fragmented, noncumulative, and—to some—irrelevant. One explanation for this perception may be attributed to the belief that concentrating on a specific type of library requires dealing with a range of functional areas that is beyond the capability of a single individual. Similarly, some perceive that selecting a functional area requires controlling equally complex environmental-clientele factors which makes generalizations difficult. While such beliefs may accurately reflect the limits of most of us, Goldhor apparently chose to ignore these as problems and concentrated on the public library as an area of study; his approach was that of a decision-maker facing many issues. It appears that to Goldhor the overarching question becomes one of "what affect would, or does, each administrative decision—regarding services or operations—have on the library's clientele?" This approach also requires asking questions about many of the underlying assumptions of each decision.

The products of Goldhor's interest in public librarianship can be placed into three broad categories: his efforts to produce a series of "public library abstracts," his development of a "public library index," and his many research-based studies. The former two activities might not qualify—by Goldhor's own definition—as "pure" research, but one can sense a relationship between the researcher's constant need to monitor the literature for data and for new ideas and the service-orientation of the public librarian. This is especially true of the abstracting of data from published and unpublished sources of public library activities. The first effort to provide a comprehensive overview of study-based

findings resulted in the production of *Public Library Abstracts* [1960a] which covered much of the decade of the 1960s. A second attempt at providing data for practitioners and researchers appeared for the years 1971 [1973c], 1972 [1973d], and later cumulatively for the 1970s [1981f] and for the early 1980s [1983c].

Prior to the development of the abstracting service, Goldhor had initiated an index of public library circulation. The principle behind this effort was to provide an indicator of activity not unlike that found in the business community: "In the world of business and finance, the Index of Leading Indicators serves to summarize in one figure for a given period of time several different facets of economic activity which are considered to be particularly important in reflecting the main trends of development" [1984c, p. 85]. The idea was to report each year's circulation activity—and, later, expenditures—in terms of a base year. This provides a trend line that can be used to judge activities of the public library sector as a whole and to permit individual librarians the opportunity to compare their libraries with a national sample [1949c]. The reason for this: "When comparable statistics are published over a period of years, they allow for comparisons over time and reveal trends which cannot otherwise be shown" [1988b, p. 594]. The index first covered Illinois [1948b] and shortly thereafter expanded to cover libraries throughout the United States [1949c].

While these two activities provide current administrators and researchers with a wealth of information in a convenient form, Goldhor's most consistent research efforts focused on the administration of public libraries. Although many of his studies focused on the various issues that must be considered for the efficient and effective administration of any institution, most of his research aimed at determining how well libraries meet clientele needs. The core of this concern revolves around the idea of meeting user needs by providing an appropriate collection of materials. Although written over forty years ago, his "A Note on the Theory of Book Selection" [1942a] remains a valid explication of the essence of public library service. It also accounts for much of his interest in evaluating collections, determining user needs, and studying factors that affect reading interests. The only modern touch that might be added—although it is not necessary—is the substitution of "information needs" for reading; the article stands the test of time. It was, in fact, one of nineteen articles selected by Barbara McCrimmon for inclusion in her anthology, *American Library Philosophy*, in which she noted her reasons for selecting J. Periam Danton, Lowell Martin, and Herbert Goldhor: "They belong to the strongest current in mid-century American librarianship, they attempt to find the true place of the library in society through sociological research, and they deal with reading as an object of controlled investigation" (McCrimmon, 1975, p. ix).

Much of the research undertaken by Goldhor made its way into what some already consider to be a classic, *Practical Administration of*

Public Libraries, written with Joseph L. Wheeler [1962d]. The response to this text was extremely favorable, not only in the United States and Canada but in the United Kingdom as well and the two authors were honored by the American Library Association with the Scarecrow Press award in 1963. The text was also translated into Spanish for use by a wider audience (Contin, 1970). Subsequently, a second edition of this text—by Carlton Rochell (1981)—was published in 1981 to incorporate newer trends. Nevertheless, a rereading of portions of the 1962 edition reveals much that remains relevant today. It is an affirmation of the belief that research that is directed toward the establishment of general principles is more likely to remain valid than other styles of studies. Even then, it is in the nature of the research-minded constantly to question previous work and to determine the limits of one's knowledge. Therefore, it is not surprising to find that some of Goldhor's most current efforts have been attempts to replicate earlier studies. One such example is his examination of borrowing behavior of users of the Kingston and St. Andrew Parish Library (Jamaica) in 1978-79 which paralleled a similar study undertaken in Illinois in 1970 [1981b].

CONCLUSION

In this essay we have sampled only a small part of a large body of Herbert Goldhor's work. What may be missing in the presentation is a sense that comes from reading many of his publications: a dedication to finding underlying principles of library practice while testing many of the assumptions we hold about such practice. His works reflect an inquiring mind, one that constantly seeks explanations. Since he continues as a productive researcher it would be premature and presumptuous to consider this a definitive look at his contribution to librarianship. It is, however, intended to indicate that much of Herbert Goldhor's work represents an invaluable store of information for scholar-researchers today and in the future.

APPENDIX

Entries are listed by year of publication, arranged alphabetically by title. Multiple entries in a single year are marked by a letter designation for easy reference. Some writings—selected mimeographed works and book reviews—were not included; items not examined for this article are marked with an asterisk. Items written with a second author are shown with initials for Herbert Goldhor (HG) to indicate whether he appears as first or second author.

1939

The A.L.A. and public librarians. *Wilson Library Bulletin*, 14(September), 43-45.

1940

- (a) Democracy and the Library. *Wilson Library Bulletin*, 15(September), 30-31, 33.
- (b) Goldschmidt, R., & Otlet, P. (Trans.). (1906). *Sur Une Forme Nouvelle du Livre: Le Livre Microphotographique*. Bruxelles: Institute Internationale de Bibliographie. (Quoted in full in Fussler, H. H. Microfilm and libraries. In W. M. Randall (Ed.), *The Acquisition and Cataloging of Books* (papers presented before the Library Institute at the University of Chicago, July 29 to August 9, 1940), (pp. 331-54). Chicago, IL: University of Chicago Press. (The translation appears on pp. 331-33.)

1942

- (a) A note on the theory of book selection. *Library Quarterly*, 12(April), 151-174. (Reprinted in B. McCrimmon [Comp.][1975]. *The American library philosophy: An anthology*, (pp. 106-31). Hamden, CT: Shoe String Press).
- (b) *The selection of employees in large civil service and non-civil service public libraries*. Unpublished doctoral dissertation, Graduate Library School, University of Chicago.

1943

Civil service in public libraries. *Library Quarterly*, 13(July), 187-211 (the essential portion of [1942b]).

1945

Guide for the operation of small army libraries. European Theater of Operations.*

1947

- (a) Function of the public library. *Gary Library Bulletin*, 5(October), 1-2* (summarized in Sees public library work entering new phase. *Library Journal*, 72(December), 1755.
- (b) How a librarian should do a field research job. *Library Journal*, 72(December 1), 1677-1679.
- (c) Panel discussion on retirement plans. *ILA Record*, 1(December), 14.
- (d) The training of soldier-librarians in the European theater. *Library Quarterly*, 17(July), 171-184.

1948

- (a) The case against specialized training for engineering librarianship. *ACRL Engineering School Libraries Section News Sheet*, 10(October), 4-5.*
- (b) Index of Illinois Public Library circulation. *Illinois Libraries*, 30(January), 9-12; (February), 89-92; (March), 127-129; (April), 163-165; (May), 187-188; (June), 233; (October), 370; (November), 434-435; (December), 488-489.
- (c) Some thoughts on the curriculum of library schools. *School and Society*, 67(June 12), 433-436.

1949

- (a) Basic principles for a retirement system for employees of local government units. In H. Goldhor (Ed.), *Retirement provisions for public librarians in downstate Illinois...* (pp. 16-30). Urbana-Champaign, IL: Illinois Library Association, (see 1949h).
- (b) Unsigned portion of Classification & certification of librarians. In H. Lancour (Ed.), *Issues in library education: A report of the conference on library education* (pp. 55-57). Ann Arbor, MI: Council of National Library Associations. (Preliminary factual summary prepared for delegates to the conference were reprinted and supplemented by reports of discussions.)
- (c) Index of American public library circulation. *ALA Bulletin*, 43(November), 334-335 (updated tables appear at irregular intervals in subsequent issues beginning with December 1949).
- (d) The index of Illinois public library circulation. *Library Quarterly*, 19(January), 46-54.
- (e) The laboratory library project of the University of Illinois Library School. In *Association of American Library Schools, Report of Meeting* (Chicago, January 21, 1949), (pp. 53-58). Chicago, IL: AALS.
- (f) New developments at the University of Illinois Library School. *ILA Record*, 3(December), 27-28.
- (g) (Editor). *Occasional Papers*, 1949-1951, 1962-1978. Urbana-Champaign, IL: University of Illinois, Graduate School of Library Science.
- (h) (Editor). *Retirement provisions for public librarians in downstate Illinois: A report of the personnel committee of the Illinois Library Association Planning Board*. Urbana-Champaign, IL: Illinois Library Association.

1950

- (a) Critique of the Library Survey. *Public Libraries*, 4(June), 31-34 (reprinted in *Illinois Libraries*, 32[November], 609-612).
- (b) Discussion [of] *The Public Library in the political process*, by Oliver Garceau. In L. Asheim (Ed.), *A forum on the Public Library Inquiry* (the conference at the University of Chicago Graduate Library School, August 8-13, 1949), (pp. 3-14). New York: Columbia University Press.
- (c) The present and future state of librarianship. Demonstration Laboratory [of the University of Illinois Library School] *Bulletin*, 6(August), 1-2.*
- (d) Training of public librarians at Illinois. *Wilson Library Bulletin*, 24(February), 430-431.
- (e) (Unsigned). *University of Illinois Library School curriculum requirements and recommendations for students preparing for public librarianship* (preliminary edition) (Occasional Papers No. 12). Urbana-Champaign, IL: University of Illinois Library School.

1951

- (Editor). *Retirement for librarians: Principles of a good plan with extended comment on typical public and private systems*. Chicago, IL: American Library Association.

1952

- (Editor). *Evansville Public Library and Vanderburgh County Public Library Staff News Bulletin* (1952-1961).

1953

- (a) (Issue editor). Current trends in public libraries. *Library Trends*, 1(April), 423-542 (also the "Introduction," pp. 425-428).
- (b) (Unsigned). Position classification and salary administration. In *Personnel administration for libraries: A bibliographic essay*, prepared by Ralph E.

McCoy assisted by the Subcommittee on Bibliography on Personnel Administration.... Chicago, IL: American Library Association.

1954

- (a) (Editor). *BPA Notes* (1954-1957). Chicago, IL: ALA Board of Personnel Administration.*
- (b) On the relationships between public libraries and special libraries. *Bulletin of the Business Division of the Special Libraries Association*, 8(May), 1-4.*
- (c) Scientific management in public libraries. *Library Trends*, 2(January), 368-389.

1955

Criteria for an ideal circulation system. *Wilson Library Bulletin*, 29(April), 637, 649-650.

1956

- (a) (HG, & Rettig, M. M.). Report on a sample audit of cards in a public library catalog. *Journal of Cataloging & Classification*, 12(July), 166-170.
- (b) Selection of clerical assistants in a public library: Report on the use of a written general intelligence test. *Illinois Libraries*, 38(April), 69-70.
- (c) Validity information exchange [Librarian Assistant]. *Personnel Psychology*, 9(Autumn), 378.

1957

Report of a survey of high school students' use of libraries. *Teachers College Journal*, 29(November), 22-24.

1958

- (a) Library-booketeria. *Library Journal*, 83(November 1), 3074.
- (b) Personnel turnover in libraries. *OLA Bulletin*, 28(April), 9-10.
- (c) (HG, & Rettig, M.). A sample audit of cards in a branch public library catalog. *Library Resources & Technical Services*, 2(Fall), 287-291.
- (d) Work simplification in libraries. *Focus on Indiana Libraries*, 12(August), 10-11.

1959

- (a) Are the best books the most read? *Library Quarterly*, 29(October), 251-255.
- (b) *A public opinion survey of the Evansville Public Library* (Occasional Papers No. 56). Urbana-Champaign, IL: University of Illinois, Library School.
- (c) We tell the public about our library. *American City*, 74(June), 113-114* (reprinted in *IULA Quarterly*, [Spring 1960], 10-11*).
- (d) The worries of a public library administrator. *Library Resources & Technical Services*, 3(Spring), 119-122.

1960

- (a) (Editor and compiler). *Public Library Abstracts*, January 1960-1967. Bloomington, IN: Indiana University, Division of Library Science, 1960-1962; Springfield, IL: Illinois State Library, 1962-1967.
- (b) Reference service analysis. *Illinois Libraries*, 42(May), 319-322.
- (c) Who reads what? *Library Journal*, 85(March 15), 1077.

1961

(HG, & Sahm, L. A.). *The renovation of a medium-sized public library building* (Occasional Papers No. 63). Urbana-Champaign, IL: University of Illinois, Library School.

1962

- (a) *The first fifty years: The Evansville Public Library and the Vanderburgh County Public Library*. Evansville, IN.
- (b) (Managing editor). *Library Trends*, (1962-1978).

- (c) A plea for a program of research in librarianship. *ALA Bulletin*, 56(January), 44-46.
- (d) (Wheeler, J. L., & HG). *Practical administration of public libraries*. New York: Harper & Row.
- (e) Standards for evaluating education for librarianship. *Bulletin of the Louisiana Library Association*, 25(Fall), 95-96.
- (f) *Toward more intensive service by the public library* (In Progress Report No. 24). Decatur, IL: Decatur Public Library.

1963

- (a) New technology: Promise and reality. *Library Quarterly*, 33(January), 102-114 (also In L. Carnovsky & H. W. Winger [Eds.], *Medium-sized public library: Its status and future* [pp. 102-14]. Chicago, IL: University of Chicago Press.
- (b) (Editor). *Selection and acquisitions procedures in medium-sized and large libraries* (Allerton Park Institute No. 9). Urbana-Champaign, IL: University of Illinois, Graduate School of Library Science.

1964

- (a) Approach to measuring reference. *RQ*, 3(July), 8, 16.
- (b) (Editor). *Proceedings of the 1963 Clinic on Library Applications of Data Processing* (held at the Illini Union, University of Illinois at Urbana-Champaign, April 28-May 1, 1963). Urbana-Champaign, IL: University of Illinois, Graduate School of Library Science.
- (c) University of Illinois Graduate School of Library Science. *Journal of Education for Librarianship*, 5(Fall), 130-135.

1965

- (a) (Editor). *Proceedings of the 1964 Clinic on Library Applications of Data Processing* (held at the Illini Union, University of Illinois at Urbana-Champaign, April 26-29, 1964). Urbana-Champaign, IL: University of Illinois, Graduate School of Library Science.
- (b) Toward the more intensive use of the public library. *Ontario Library Review*, 49(August), 125-126 (contents of a speech as reported by Stanley Beacock and John Parkhill).

1966

- (a) (HG, & McCrossan, J.). An exploratory study of the effect of a public library summer reading club on reading skills. *Library Quarterly*, 36(January), 14-24.
- (b) (Editor). *Proceedings of the 1966 Clinic on Library Applications of Data Processing* (held at the Illini Union, University of Illinois at Urbana-Champaign, April 24-27, 1966). Urbana-Champaign, IL: University of Illinois, Graduate School of Library Science.

1967

- (a) Emerging library systems: The 1963-66 evaluation of the New York State Public Library systems, a reaction. *Bookmark*, 26(July), 317-318.
- (b) *A plan for the development of public library service in the Minneapolis-Saint Paul metropolitan area*. Urbana-Champaign, IL: University of Illinois, Graduate School of Library Science.
- (c) University of Illinois Library School. *Illinois Libraries*, 49(May), 398-400.

1968

- (a) Doctoral program, University of Illinois. *Journal of Education for Librarianship*, 8(Spring), 269-271.
- (b) (Editor). *Research methods in librarianship: Measurement and evaluation* (papers presented at a conference conducted by the University of Illinois,

Graduate School of Library Science, September 10-13, 1967) (Monograph Series No. 8). Urbana-Champaign, IL: University of Illinois, Graduate School of Library Science.

- (c) Library personnel—crisis and challenge: III: What are the problems of training personnel? In *Libraries in transition: Responses to change* (selected papers from North Central Library Conference, Milwaukee, Wisconsin, October 14-16, 1967), (pp. 31-32). Madison, WI: Wisconsin Library Association.

1969

- (a) (HG, & Goldstein, H.). Selection of public library trustees. *Illinois Libraries*, 51(February), 92-94.
- (b) *Introduction to scientific research in librarianship* (U.S. Office of Education, Bureau of Research). Also reprinted as Monograph No. 12, University of Illinois Graduate School of Library Science, 1972, chapter 3, The application of scientific research to librarianship, reprinted (see item [1976a]).

1970

Democratic administration and morale. In R. H. Rockwood (Ed.), *Personnel utilization in libraries: Selected papers* (pp. 6-17). Tallahassee, FL: Florida State University, School of Library Science.

1971

- (a) (Editor). *Education for librarianship: The design of the curriculum of library schools* (Monograph No. 11). Urbana-Champaign, IL: University of Illinois, Graduate School of Library Science.
- (b) (HG, & Lenfest, D. D.). Interdepartmental training program for science information specialists at the University of Illinois. *Journal of Education for Librarianship*, 12(Fall), 84-91.
- (c) Public library statistics, 1968. In J. Johnson (Ed.), *Bowker annual of library and book trade information, 1971*. New York: R. R. Bowker.
- (d) Tribute [to Robert B. Downs] from a close colleague. *Wilson Library Bulletin*, 45(June), 920.

1972

- (a) The effect of prime display location on public library circulation of selected adult titles. *Library Quarterly*, 42(October), 371-389.
- (b) *Introduction to scientific research in librarianship* (Monograph No. 12). Urbana-Champaign, IL: University of Illinois, Graduate School of Library Science (reprint of item [1969b]).
- (c) Library: Administration. *The Encyclopedia Americana* (1972 ed.). New York: Americana, Vol. 17, 375-377 (article appears in subsequent releases; last copyright is 1984).
- (d) (Contributing editor). *Newsletter of Library Research*, Nos. 1-18. Urbana-Champaign, IL: University of Illinois, Graduate School of Library Science, 1972-1976.

1973

- (a) Analysis of an inductive method of evaluating the book collection of a public library. *Libri*, 23(1), 6-17.
- (b) The future of education for library and information services. In M. Boaz (Ed.), *Toward the improvement of library education* (pp. 109-21). Englewood, CO: Libraries Unlimited.
- (c) Public library abstracts: 1971: Abstracts of statistics in American public library annual reports for the year ending in 1971. Springfield, IL: Illinois State Library.
- (d) *Public library abstracts: 1972: Abstracts of statistics in American public li-*

brary annual reports for the year ending in 1972. Springfield, IL: Illinois State Library.

- (e) Statement prepared for the National Commission on Libraries and Information Science. In A. F. Trezza (Comp.), *In our opinion* (Regional hearing before the National Commission on Libraries and Information Science, September 27, 1972, Chicago, Illinois) (pp. 103-04). Springfield, IL: Illinois State Library.
- (f) A summary and overview of the conference. In G. S. Bonn (Ed.), *Information resources in the environmental sciences* (Allerton Park Institute No. 18) (pp. 224-30). Urbana-Champaign, IL: University of Illinois, Graduate School of Library Science.*

1974

The use of late respondents to estimate the nature of non-respondents (ED 083 309). Bethesda, MD: ERIC Document Reproduction Service (also in *Newsletter on Library Research*, No. 18[December], 3-6).

1975

- A note on the theory of book selection. Reprinted in B. McCrimmon (Comp.), *American library philosophy: An anthology* (pp. 106-31). Hamden, CT: Shoe String Press (originally published in *Library Quarterly* [1942a]).

1976

- (a) The application of scientific research to librarianship. In P. Brophy, M. K. Buckland, & A. Hindle (Eds.), *Reader in operations research for libraries* (pp. 29-33). Englewood, CO: Information Handling Services, Library and Education Division (reprint of chapter 3 of item [1969b]).
- (b) The indices of American Public Library Statistics. *Illinois Libraries*, 58(Febuary), 152-158.
- (c) The use of late respondents to estimate the nature of non-respondents. *Newsletter on Library Research*, No. 18 (December), 3-6.

1977

- (a) *Analysis of the 1974-75 Illinois Public Library Statistics* (Illinois State Library Report No. 3). Springfield, IL: Illinois State Library.
- (b) Foreword to *The measurement and evaluation of library services*, by F. W. Lancaster. Washington, DC: Information Resources Press, pp. vii-viii.
- (c) The library information service at the University of Illinois. *Serials Librarian*, 2(Winter), 167-169.

1978

- (a) An experiment in literature service to a group of local decision makers. *RQ*, 17(Summer), 306-307.
- (b) Impressions and recollections: 1946-78. *University of Illinois Library Staff Bulletin*, 35(May), 7-13.*
- (c) Library statistics for 1974 published by state and provincial library agencies. In B. Glick & F. Simora (Eds.), *Bowker annual of library & book trade information, 1978* (23rd ed) (pp. 215-34). New York: R. R. Bowker.
- (d) Some lessons from a statewide application of performance measures for public libraries. *Illinois Libraries*, 60(May), 472-486.
- (e) Summary [of the Institute]. In S. K. Richardson (Ed.), *Children's service of public libraries* (Allerton Park Institute No. 23) (pp. 167-74). Urbana-Champaign, IL: University of Illinois, Graduate School of Library Science.
- (f) (Unsigned). University of Illinois annual survey: Public library spending still climbing. *American Libraries*, 9(September), 483.

1979

- (a) An evaluation of the Illinois Interlibrary Loan Network (ILLINET). *Illinois Libraries*, 61(January), 13-18.
- (b) The patrons' side of public library reference questions. *Public Library Quarterly*, 1(Spring), 35-49 (reprinted In B. Katz & A. Clifford (Eds.), *Reference and information service: A new reader* (pp. 64-80). Metuchen, NJ: Scarecrow Press ([1982f]).
- (c) *A study of public library book collections in the humanities* (ED 179 189). Arlington, VA: ERIC Document Reproduction Service.
- (d) US public library adult non-fiction book collections in the humanities. *Collection Management*, 3(Spring), 31-43.

1980

- (a) Community analysis for the public library. *Illinois Libraries*, (April), 296-302.
- (b) (Highum, C.; HG; et al.). *The Illinois library materials processing center: A study* (Report No. 5). Springfield, IL: Illinois State Library.*
- (c) Pesquisa em biblioteconomia "in loco." *Revista de Biblioteconomia de Brasilia*, 8(January), 14-19.*
- (d) A sabbatical in Jamaica. *University of Illinois Library School Association News Letter*, No. 94, 3-4.
- (e) Some measures of adult use of public library books. *Illinois Libraries*, 62(October), 641-643.
- (f) HG, & Smith, L. C.). Special libraries serving state government agencies. In F. Simora (Ed.), *Bowker annual of library & book trade information, 1980* (25th ed.) (pp. 392-95). New York: R. R. Bowker.
- (g) University of Illinois annual survey: Public libraries spend fewer "real dollars," show circulation decline. *American Libraries*, 11(July/August), 448.

1981

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The Right Study of the Right Issues at the Right Time: Conducting In-House Studies in Public Libraries

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ABSTRACT

THE RIGHT IN-HOUSE STUDY of the right issues at the right time is a valuable managerial resource for library administrators. Effective studies are characterized by clear statements of the study questions, careful translation into measurable terms, appropriate study design, adequate staff training, timely data analysis, and targeted reporting. Studies that are done within a library's existing management and communication structure are most likely to have the desired impact on decision-making.

INTRODUCTION

The skylarks of science offer corroboration of their truth through their similarity; the skylarks of artists and poets through their dissimilarity.

—*Rabindranath Tagore*

To be a good public librarian means, in part, to provide "the right book (or information) for the right person at the right time," either by directly assisting the enquirer or through management decisions that ensure that the resources are available and easy to locate without staff intervention. One of the hallmarks of our professional commitment has been a dedication to the particular, to meeting the unique needs of an individual user, to finding a specific fact or item. Our professional education and practice has instilled in us the instinct to look for what is unique or different; this book is different than that one so it gets a particular Dewey number; this anthology of quotations is enough different from the six we already have so we should buy it; this format is different enough from the format in which we already have the information so it might reach new users; and, most importantly, each interaction with a user is different because of users' unique personality and

needs. This cultivated discernment of uniqueness that enriches the transaction level of professional practice must be supported by a scientific look at the similarities which are subject to managerial decision-making if the best possible library services are to be provided for our communities. In-house studies are managerial tools which provide occasions for describing, understanding, and improving public library services by focusing attention on the similarities in our practice rather than on the differences.

DECIDING WHAT TO STUDY

In-house studies always start with questions from someone. What do people actually *do* when they visit this branch? Who are the video borrowers? Are they new library users? Do they ever borrow books? How do children use this library? Why don't people ask for help when they can't find something? How can users be given a better chance of finding what they are looking for? What is the average time it takes to get a book from the shipping carton to the shelf?

Some questions can be answered by data that simply describe behaviors, resources, or patterns. A short user survey can answer the questions of what people do in the library by asking respondents to check everything on the list they did on their visit to the library. A well designed study addressing these questions will provide a fairly comprehensive answer—X percent borrow books, Y percent read periodicals, and so on. Similar studies can be done to describe video borrowers demographically, to depict library use by children, or to answer any other question that merely requires a count of behavior, resource use, or interaction.

Other questions relate to planned changes. If a library administrator wants to know whether changing from providing separate service desks for adults and children to providing a single service desk for all patrons will decrease service to children, data collection "snapshots" must be taken before and after the change. A well designed study for questions of this sort can reduce anxiety about change and hedge the necessary risks, but must be linked to judgment and staff politics too.

In-house studies are often motivated by a desire to demonstrate the value of the library or of a particular service. Demonstrating the worth of a summer reading program by measuring the impact on participants is a worthy goal but is the sort of study usually beyond the scope of most public library staff because the measurement of impact requires sophisticated statistical skills and research design. If such studies are needed, consultants can usually be hired or advice can be sought from statistics experts in the fields of education or business.

The purpose of this article is to address issues of concern to librarians contemplating fairly simple in-house studies utilizing staff with key, but very basic, skills. Such studies are an important resource for management. If done effectively, these studies help managers make

good decisions. They are different in intent and in implementation than basic research studies. In-house studies arise from the need to make decisions about a particular situation. Basic research studies are grounded in a theoretical construct and, it is hoped, have at least cautiously generalizable results. The audience for in-house studies is the people involved in the decision-making process or those affected by them. The audience for basic research studies is, more often than not, other researchers. In-house studies are designed with a primary focus on using methodologies that are "good enough." The study design for basic research must stand up to critical review by professional researchers.

However, in-house studies are not merely poor excuses for research studies any more than convenience stores are poor excuses for large supermarkets. They simply have different purposes and different indicators of success and excellence.

Deciding on the In-House Study Question

An in-house study question rarely arrives on the management agenda clearly stated, awaiting only study design and implementation. Focusing and clarifying the study question is crucial to conducting a successful study but often is given little attention. For example, a library board member asks why there are never any new books on the shelves at the library. He/she knows the library buys books all the time; in fact, he/she walked through the processing department on the way to the board meeting and saw cartons of books stacked up there. Responses a library director might offer could include the traditional statements about not having enough money for books, the public always borrows the new books so only the old ones are left, and so forth. Such statements probably would not lead to in-house studies. However, an astute director might discover that the trustee's real question is why all the books are in the processing department rather than on the shelf. Such a reframing of the question could easily lead to an in-house study and perhaps even lead to justifying an additional position in technical services.

The first step in deciding what to study is to determine what the real question is, a process which often requires the same probing skills as a reference interview. If the earlier mentioned director assumed the trustee's question really was why there weren't any new books on the shelves, he/she might have responded by offering an analysis of circulation records by copyright date to prove that the new books were in the hands of users and not on the shelf. If he/she assumed a need to demonstrate the inadequacy of the book budget, he/she might offer an analysis of book budget trends, book price trends, and numbers of titles acquired. Neither of these information pieces would have answered the trustee's real question.

Assuming the real question is finally understood to be, Why is there such a backlog? it now becomes important to identify related questions.

Is the backlog temporary or chronic? Is it due to unusual conditions such as a temporarily vacant position? Where in the loading-dock-to-shelf chain are things being held up? Why?

Beneath most management questions is a sense either that something is broken and needs fixing, or that something is acceptable but could be improved. In this case, the trustee's question has indicated that something is broken and needs fixing. New books belong on the shelf or with the patron and not in the processing department. It is appropriate at this stage for the library director to reflect on what decisions one might make to solve the problem and to be certain any data gathering effort will include information needed to take the most effective action. Assuming the director has support to hire another processing clerk if the board can be persuaded to add the position, the director will need to plan a study that demonstrates that the bottleneck is in processing—not cataloging—and will need to complete the study in time to reflect the board's reaction to the findings in the budget for the next fiscal year.

The first steps in conducting the right study of the right issues at the right time are to carefully and comprehensively outline management concerns by identifying the basic question, determining related questions, understanding what and how decisions will be made using the information, and establishing a time frame for the study based on when the information is needed.

If these first four steps have been carefully done, framing management concerns in measurable terms—the next step—will be easier. The question about the backlog in processing has several quantitative aspects:

- Just how big is the backlog?
- Should the backlog be quantified in terms of number of items?
Number of titles? Type of material? Length of time it has been awaiting attention?
- Is it regularly this big?
- Is the backlog bigger in processing than in other sections of technical services?
- How long does the carton-to-shelf trip usually take for new books?

Recalling that the trustee's question is why new books are in technical services rather than on the shelves, it appears that all of the earlier questions need to be answered by the study—and a few more.

After identifying what primary data need to be gathered, managers should identify additional information from the management setting or from secondary sources which will be helpful in designing the study and/or in understanding the outcomes. In the backlog example, the usual flow of materials through technical services should be documented in terms of who does what to each book and when. It would also be helpful to know if other comparable libraries have information about their average carton-to-shelf time.

In-house studies always tend to be political. At this very early stage, some of that can be minimized. Studies carry an air of evaluation even if they are not presented and described as evaluative studies. Once initiated, studies are perceived as either being done to a person or group or with a person or group.

The performance of one or more individuals is under examination no matter what part of the library's operation is being investigated. In the case of our example, surely the manager of technical services as well as all persons working in the department would feel uneasy about a study of backlog. At this point the director should take two steps if the study is to contribute to the solution of the problem and not just to document its dimensions. Key people whose work lives affect the area under study should be gathered for a discussion of the issues, background, and study design. Often people closest to the problem are aware of it and will welcome the opportunity to contribute to its solution. They may also be aware of related problems which could be solved at the same time with little additional effort. The second step the director should take is to invite those with related problems to submit them to the study development team, as much to broaden ownership of the study as to get the biggest "bang for the buck" in information gathering and analysis. For example, the technical services manager might note concern about the pace with which audiocassettes move through the department. As long as a methodology is being developed for tracking books, why not apply it to audiocassettes as well?

The first major stage of the in-house study is complete when the management concerns are clearly identified and translated into measurable terms, other key information is available, and appropriate staff are properly informed and involved.

Designing and Implementing In-House Studies

Designing the right study of the right issues at the right time requires a careful and realistic look at the resources that either are available or that could be made available to do it. Study design and implementation require expertise and time.

The search for expertise in study design should begin with the literature from the fields of librarianship, business, and the social sciences. There are any number of good basic books in statistics, market research, and the like. There are very few resources that give start-to-finish directions applicable to in-house studies. The Public Library Association's *Output Measures for Public Libraries* is one such manual, and it covers only twelve measurement efforts. It provides good basic instruction about conducting studies even if different data are needed. A similar manual is under development for academic libraries by the Association of College and Research Libraries.

Staff in some libraries may have the requisite data collection and analysis skills to oversee in-house studies. Knowledge of sampling and

data collection methodologies and descriptive statistical techniques are the basic requirements. If no such skills are available on the staff, a look around the community may produce either payable or volunteer consultants who could ensure that adequate levels of validity and reliability are built into the study design, and that meaningful, appropriate data analyses are performed.

If the data produced by the study are extensive or require substantial manipulation, computer support should be identified very specifically at the study design stage to ensure that data are collected in a form that can be used by the computer software and operator.

The study designer needs to be familiar with good research methodology and willing to make tradeoffs which ensure that as little effort as possible is required to complete the study, but that validity and reliability are not compromised. In the backlog study being used as an example, a study methodology might be developed which selected for tracking all books on the loading dock each Tuesday for a month. In a large library system this might mean a total of hundreds of books, probably much more than necessary for study reliability. An alternative design would be to track all the books on one day determined by drawing a date out of a hat. This would provide a smaller but equally random sample. The path for some of these books might be subject to one time rather than repeated slowdowns or blockages, but participants in data collection would know this and could either repeat or adjust data collection. If the study question has been carefully translated into measurable terms, validity should not be difficult to achieve.

Many in-house studies fail because time is not made available for key participants to carry out their responsibilities. The considerations are obvious. Major studies should not be undertaken at times when there are extraordinary demands on many staff such as the installation of a new computer system, opening a new branch, or reorganization of staff. Staff who already carry full loads should not have study management thrust upon them unless some other responsibility is set aside. "One more thing" added to an already full agenda will probably not be tended with care. Thoughtful planning should be done ahead of time to identify how much of whose time will be required to complete the study by the decision-making deadline.

Communication needs to be thought through carefully if the design and implementation stage of the study is to go smoothly. The timing and extent of communication varies depending on the organizational site of the study, the content, and the audience. Generally speaking, each of the following study developers and participants need to know certain things:

Library Administration/Governing Board

Questions the study will address

Specific objectives

General information on methodology, including expectations of use of staff time

Time frame

Cost

Study Designer/Manager

Audience for the findings

Questions the study will address

Specific objectives of the study

Parameters of methodology such as amount of time and money available for support

Technical and logistic support available

Time frame

Staff in Affected Departments

Context and scope, including management's concerns and possible decisions

Expectations regarding availability of their time and expertise to support the study

General sense of the methodology

How they will be informed of results

There are many ways to inform people about studies. Established communication channels should be used whenever possible and appropriate. This does two things: it saves time and it keeps the existing chain of command in place, a reassuring thing if the study is perceived by some participants as threatening. It is better for the study manager to be on the agenda of the regular monthly meeting of the technical services department rather than call a special meeting. Use of staff newsletters, memos, board packages, and regularly scheduled meetings keep the study firmly within the management framework of the library, exactly where it should be to be effective.

If a study involves the public directly, there should be clear signage in the library facility once it is underway. Press releases and public service announcements should *not* be used. Effective use of sampling dictates that typical behavior be reflected in counts or answers to questions. People should not be encouraged to use the library any differently than they normally do.

Public library patrons often believe that, no matter what reason is officially given for a study, the *real* reason is that "they" are going to close the library. Library staff should not be surprised by this suspicion and should have a thoughtful response. If such questions seem particularly likely due to tight city budgets or major political changes, the jurisdiction's governing body should be notified about the study so they are not caught uninformed if upset patrons call city offices to express their concern.

The study plan must ensure adequate time for training people with data collection responsibilities. Too often this step is overlooked resulting in mistakes which either cast doubt on the validity of the entire study

or which make costly corrective actions necessary. It is not good enough to tell volunteers simply to stand at the door and hand out survey forms to everyone. They should be given a briefing about why the library is doing the study, some understanding of sampling, and brief scripts about what to say in the initial request to the user and how to respond to predictable situations. They should always know who is backing them up if a situation develops they cannot comfortably handle.

In studies involving the public, all staff should be trained to provide accurate but neutral answers to users' questions about the purpose of the study. They should be carefully instructed *not* to imply desired outcomes of the study which might bias user responses. A query about why a materials availability study is being done should *not* receive a response such as: "We're trying to get more money for books by showing that people can't get the ones they want." A much more appropriate reply is: "We are interested in finding out what kinds of materials people, who came to the library today, are looking for and whether they are able to find them."

All data collectors, whether they be volunteers handing out survey forms, reference librarians making check marks on a form, or catalogers date stamping a routing slip, should have a trial data collection period, followed by a conversation with the study director to air questions about any confusion that may have occurred. Situations that are "perfectly obvious" to the project manager may not be to anyone else. Forms may not be clear. Circumstances may occur which mean instructions for data collectors need to be revised. In addition to contributing to the accuracy of the study, a data collection dry run contributes to the confidence of the participants. How people feel about doing the study will affect how they feel about implementing its recommendations later on.

After the right questions are identified, the right study designed, and all data collectors properly trained, the next step is to conduct the study as planned, doing all that can be done to ensure that typical situations are being observed and measured. If this seems not to be the case, stop the study. Do not proceed until the abnormality is resolved. If library use is being measured and there is a huge snowstorm, don't collect data as planned. Select another time. If a cataloger is ill for a week, reschedule the backlog monitoring when he returns—unless you are trying to demonstrate the effect of vacancies on the flow of materials. This seems like an obvious point, but in the complex operations of even a small library, something is usually atypical every day. The study should be stopped only if the variation in routine is known to affect variables under study. The snowstorm shouldn't affect the backlog study unless staff can't get to work. A staff illness shouldn't affect an in-library materials use study since patron behavior won't be affected. Be aware, however that, for any measurement of quantity of service provided by staff, many staff will feel that their busiest days should be documented rather than typical days and so are likely to note that randomly selected days will not produce reliable data.

The study director should review completed data collection forms throughout the study to catch errors or misunderstandings before they accumulate and ruin the study. If reference questions are being sampled

one day each week for a month, the first batch should be reviewed before the second data collection day, etc. If the study goes on for a long period, participants should be kept informed and encouraged at regular intervals.

Timely correct data analysis is essential for an in-house study to be considered successful. Not only is the information needed for decision-making, but stakeholders in the process will want to know the results. A preliminary report should be available within a month after data collection has finished. If possible, the study manager should schedule a meeting with stakeholders to review the findings and suggest interpretations. This is particularly important if the study manager is not personally familiar with the events under study. Correctly analyzed but wrongly interpreted data may lead to bad decisions.

REPORTING AND USING IN-HOUSE STUDIES

Disseminating findings from in-house studies may be the responsibility of the study manager or of others. The managers will usually be asked to write a report, either for the study client directly or for the library director. Four guidelines for doing such reports successfully are:

- Be brief
- Be clear
- Report on what interests the client first (methodology never does!)
- Be graphically interesting

The report author/study manager should be very clear about whether or not the report is to include recommendations for action, and, if so, how specific these should be and from whom the recommendations should come. Sometimes in-house studies are intended to serve as background for action planning, so the responsibility for developing recommendations rests with an administrative council, board of trustees, or the director after the conclusion of the study.

Some in-house study reports may have several target audiences and others may have only two—the client and the stakeholders. Each audience should receive the information they need in an appropriate format with appropriate amounts of detail. Often study managers, having been immersed in the study for weeks, believe everyone needs to know all about everything related to the study. This is not true. Background information should always be available for those who want or need it, but trees shouldn't be felled to create long reports for people whose interest can be met with a three page executive summary.

It is a courtesy—as well as good management—to inform people whose jobs may be affected about study findings before sharing them in a public forum. The backlog study findings and recommendations should be reviewed with technical services staff before being taken either to a general staff meeting or to the board. Often report recommendations will be supported by staff participants, enabling an administrator

to go to the larger audience in a stronger position. If opposition to recommendations is expected, it can be clearly stated that the report is being shared with the department for information and not for endorsement.

The successful in-house study, as described earlier, has begun and stayed within the library's management structure. Library administrators should not permit in-house studies to be conducted if they are not willing to use the results in decision-making. If they are willing to do this, the project design should spell out authority, reporting relationships, budget, and time frame. Recommendations should be acted on. Action taken should be documented and reported. Staff time and energy are too valuable to waste. If staff are asked to do studies that don't matter, they will assume, rightly, that their time and skills don't matter. That is not a message an administrator wants to send.

Finally, when the right study of the right issues at the right time is finished, the study director should assemble a comprehensive file including the study plan, all related memos, a sample of all data collection forms, the report, and any other documentation that was generated. Completed data collection forms should be kept for a year, but the master file should be retained at least five years.

Effective in-house studies are like other effective projects. They succeed when communication is clear, when strategies are appropriate, and when implementation is thorough. They are a resource managers cannot afford to ignore.

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